

# A TAXONOMIC REVISION OF THE WEEVIL GENUS TYCHIUS GERMAR IN AMERICA NORTH OF MEXICO (COLEOPTERA: CURCULIONIDAE)<sup>1</sup>

by

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## ABSTRACT

A study of morphological characters of 4,000 adult weevils used in preparing a key and descriptions indicates there are fifteen North American species in the genus *Tychius* Germar. Adults occur on plants in the genera *Astragalus*, *Baptisia*, *Hedysarum*, *Lotus*, *Lupinus*, and *Oxytropis*.

The genus is divided into two species groups. The *T. sordidus* group appears to have representatives in the Old World fauna, but the *T. semisquamosus* group is probably native to North America.

New names, *Tychius caesius*, and *T. hirsutus* are proposed for *T. armatus* Green, 1920 (not Tournier, 1873), and *T. hirtellus* LeConte, 1876 (not Tournier, 1873) respectively. Three species, *T. badius*, *T. montanus*, and *T. phalarus*, are described as new. A neotype is designated for *T. aratus* Say. Lectotypes are designated for *T. tomentosus* (Herbst), 1785, *T. stephensi* Schoenherr, 1836, *T. lineellus* LeConte, 1876, *T. semisquamosus* LeConte, 1876, and *T. hirtellus* LeConte, 1876. The name *Paratychius* Casey, 1910, is newly placed in synonymy with *Tychius* Germar, 1813.

## INTRODUCTION

Weevil species assigned to the genus *Tychius* Germar, 1817, have been described from North and South America, Europe, Africa, Asia, and Australia. The majority of approximately 266 species occur in the Mediterranean region (Klima, 1934). Fourteen native and one introduced species are known to occur in North America.

So far as is known, all species of *Tychius* infest the pods of leguminous plants. Several species are of economic importance in the Old World (Muka, 1955). One of these, *T. stephensi* Schoenherr, 1836, has been introduced into North America and is a pest of cultivated clover. The native North American species have been recorded from plant species in the genera *Astra-*

*galus*, *Hedysarum*, *Oxytropis*, *Lotus*, *Lupinus* and *Baptisia*. Some *Tychius* species may play a part in the natural control of these plants (Marcovitch, 1916), some of which are poisonous to livestock (Hulbert and Oehme, 1961).

To date the most complete treatments of the genus are the works of LeConte (1876), and Casey (1892, 1910). These papers provide keys and descriptions of some species, but are of limited use in identifying specimens. The objectives of this revision have been to provide accurate descriptions and keys for the identification of new and known species, and to contribute to the knowledge of the biology and phylogeny of the group.

## HISTORY

The genus *Tychius* was established by Germar (1817:34), who used the name in association with the previously validated specific names, *quinquepunctatus* L. (cited 5-punctatus), *venu-*

*stus* Fabricius, and *picrostris* Fabricius. By subsequent designation, Schoenherr (1825:583) designated *Curculio quinquepunctatus* Linnaeus as the type-species. In the same work Schoenherr

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erected *Miccotrogus* as a subgenus of *Tychius*. Later (1826:245-247) he characterized *Tychius* as having seven and the subgenus *Miccotrogus* as having six antennal funicular segments. Stephens (1839:229) elevated *Miccotrogus* to the rank of genus.

*Tychius stephensi* was described by Schoenherr (1836:412), evidently prior to its introduction into North America. Thomas Say (1831) described *Tychius aratus* and *T. amoenus*. *Tychius amoenus* was transferred to *Pachytychius* Jekel by LeConte (1876:168, 216), and was included in *Smicronyx* Schoenherr by Anderson (1962:264-266). Gyllenhal (1836:414-415) applied the name *Tychius arator* to a specimen received from Thomas Say, identified by Say as *T. aratus*. LeConte (1876:216-218) described as new, *Tychius lineellus*, *T. sordidus*, *T. tectus*, *T. semisquamosus*, *T. hirtellus*, and *T. setosus*.

Casey (1892:411-425) divided the North American species of *Tychius* into four subgenera; I and II possessing seven and III and IV possessing six antennal funicular segments. Subgenus I was characterized as having "... the elytral intervals entirely devoid of recurved setae," and subgenus II as having "... elytral intervals with recurved semi-erect setae." Subgenus III was defined as "... with recurved setae, the entire facies almost as in group II . . .," and subgenus IV as "... the species generally minute, with or without erect setae. . . ." Subgenus I contained *T. lineellus* LeConte, *T. sordidus* LeConte, *T. tectus* LeConte, and *T. arator* Gyllenhal. Subgenus II contained *T. hirtellus* LeConte, *T. semisquamosus* LeConte, *T. aratus* Say, and two species described as new, *T. soltau* and *T. lamellosus*. In subgenus III Casey placed a single species described as new, *T. proxilus*. Subgenus IV contained *T. setosus* LeConte and six others described as new, *T. variegatus*, *T. simplex*, *T. sibirinoides*, *T. mica*, *T. subfasciatus*, and *T. hispidus*. Casey did not recognize *Miccotrogus* in this work because a specimen sent to him by

Desbrochers, identified as *M. picirostris*, had seven instead of six antennal funicular segments, and because his own North American species with six funicular segments, *T. proxilus*, agreed closely in other respects with the other species of *Tychius*. I have examined a specimen in the Casey collection identified as *M. picirostris* and found it to be a *Tychius stephensi* Schoenherr. Casey (1897:664-666) described three species which he assigned to subgenus IV; *T. sultcatulus*, *T. inermis*, and *T. transversus*. Another North American worker, Schaeffer (1908:217-219) described *T. griseus*, *T. suturalis*, *T. pallidus*, and *T. albidus*. In a subsequent note (1915:197) he stated that *T. griseus* was a synonym of a species he called *Tychius (Micotrogus) picirostris* (Fabricius).

Casey (1910:132-142) established the subgenus *Paratychius* for *T. proxilus* which he had formerly assigned to subgenus III and *T. imbricatus* which he described as new. In the same publication he erected the subgenus *Microtychius* to include the species formerly assigned to subgenus IV, as well as thirteen species described as new; *T. erraticus*, *T. puellus*, *T. atomus*, *T. echinus*, *T. vernilis*, *T. fatuus*, *T. fraterculus*, *T. gryppus*, *T. dulcis*, *T. imbellis*, *T. porcatus*, *T. curtipennis* and *T. errans*. He also described nine species belonging to subgenus I, *T. tacitus*, *T. hesperis*, *T. radians*, *T. dilectus*, *T. probus*, *T. texanus*, *T. carolinae*, and *T. languidus*. Five species occurring in the eastern United States, including one described as new, *T. liljebladi*, were treated by Blatchley and Leng (1916:245-247). Leng (1920:321) listed all of the species described by Schaeffer (1908:217-219), except *T. griseus*, under *Microtychius* Casey.

Kissinger (1964:57-58) transferred *Paratychius* and *Microtychius* to the genus *Sibinia* Germar and suggested further study to determine the true relationship of these groups to *Tychius*. I have followed his classification, but I include *Paratychius* in *Tychius* instead of *Sibinia*.

## MATERIALS AND METHODS

Most of approximately 4,000 specimens examined in this study were borrowed from collections of institutions in the United States and Canada. I collected about 1,500 specimens.

The following abbreviations are used to indicate the collections in which the specimens examined are deposited: AMNH, American Museum of Natural History, New York; UA, Uni-

versity of Arizona, Tucson; BYU, Brigham Young University, Provo; CAS, California Academy of Sciences, San Francisco; CIS, California Insect Survey, University of California, Berkeley; CNC, Canadian National Collection, Ottawa; CU, Cornell University, Ithaca; FMNH, Field Museum of Natural History, Chicago; INHS, Illinois Natural History Survey, Urbana; ISU,

Iowa State University, Ames; UK, University of Kansas, Lawrence; LA, Los Angeles County Museum, Los Angeles; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge; CWO, collection of Charles W. O'Brien, Texas Tech University, Lubbock; OSC, Ohio State University, Columbus; OSU, Oregon State University, Corvallis; PANS, Academy of Natural Sciences of Philadelphia; TAM, Texas A. & M. University, College Station; USNM, United States National Museum, Washington, D.C.; USU, Utah State University, Logan; WEC, collection of the author.

I have examined the types of all known North American species and their synonyms except the types of some alleged synonyms of *Tychius stephensi* Schoenherr and the type of *T. aratus* Say which is presumably destroyed (LeConte, 1859:vi).

All measurements were made using a calibrated eyepiece reticule with a dissecting microscope at magnifications up to 80 times. Total length and width were measured from the dorsal aspect, length from the dorsal margin of the eyes to the elytral apices, width at the widest point across the elytra. Length of the rostrum was measured from the lateral aspect from the

apex to the anteroventral margin of the eye. Length of the pronotum was measured from the lateral aspect from the anterior margin to the base. Other measurements require no further explanation.

Male external genitalia were removed for study. Specimens were taken directly from alcohol, or if previously mounted, soaked in warm water until soft. Holding the specimen between the thumb and forefinger, the abdomen was forced down with a pin exposing the tergum. The tergum was torn with a pin and the pin inserted beneath the median lobe to lift it into view. The structure was then removed with a pair of jeweller's forceps. Genitalia were placed in 10 percent KOH to remove muscle tissues, washed in 90 percent alcohol, then stored with glycerin in polyethylene microvials attached to the pin with the specimen.

Line drawings were made with grid paper and an eyepiece reticule in a dissecting microscope. Genitalia were drawn immersed in glycerin. Definitions of terms used, except those describing genitalia, may be found in Torre-Bueno (1962). Terms used in reference to genitalia are those of Sharp and Muir (1912).

## BIOLOGY

Biology of the red clover seed weevil *Tychius stephensi* Schoenherr, has been studied by Muka (1955). According to him larvae feed on developing seeds of red clover while adults feed on reproductive portions of flowers of the same plant. Adults overwinter in soil around the host plants, and emerge in the spring and commence a migration flight. Females oviposit in the florets, laying one egg per floret on the ovary inside the corolla tube. In New York state there are two generations per year on red clover.

Adults of *Tychius lineellus* were observed on *Lupinus leucophyllus* at the mouth of Hobbler Creek Canyon, Utah County, Utah, on May 3, before the plants were in bloom. Copulating pairs were seen on florets; females with their rostra piercing the corolla of partially opened flowers. Apparently females feed on pollen grains. This was indicated by examination of gut contents and fecal material which were similar in color and texture to pollen of the Lupines.

Before ovipositing, the female makes a hole in the calyx and deposits one or two eggs on

the side of the ovary. Larvae feed on seeds in the developing pods. When the larvae are mature they evidently chew a hole in the side of the pod and drop to the ground to pupate. Although no larvae or pupae were actually found in the soil, holes were observed in the sides of mature pods which showed signs of infestation. Muka (1955) described similar habits in *T. stephensi*. According to Mitchell and Pierce (1911), larvae of *T. sordidus* "emerge" from *Baptisia* pods and pupate in the ground.

On May 19, pods of *Astragalus utahensis* (Torr.) T. and G., the host of *Tychius prolixus*, were collected at Provo, Utah. Several larvae were taken from the pods at that time, and on July 28, four adult weevils were taken from the bag containing the pods. These pods were subsequently dissected and out of 266 pods, 18 showed signs of infestation including several containing dead larvae. White cocoons about 3.5 mm in length were found in two of the pods, and holes about 1.3 mm in diameter were observed in the sides of the pods in the portion covered by the cocoons. This does not provide

conclusive evidence that the weevils normally pupate in pods, since Muka (1955) states that *T. stephensi* can be "forced" to pupate in the pods.

On August 1, a few live adults were sifted from soil taken beneath *A. utahensis* indicating that the weevils may overwinter as adults.

### INTRASPECIFIC VARIATION

The sexes can be distinguished by differences in the structure of the pygidium. The pygidium of the male in its normal position is nearly perpendicular to the longitudinal axis of the body and is visible for more than half its length beyond the elytral apices. A transverse carina divides it along the line normally attained by the elytral apices. The pygidium of the female in its normal position is oblique rather than perpendicular to the longitudinal axis, nearly covered by the elytra, and lacks a transverse carina.

The rostrum of the female is usually longer and more slender than that of the male especially in *T. aratus* (Fig. 3), where the rostrum of the female is more than half the length of the body. The antennal insertion is normally more distad and the distal portion less strongly tapered and with deeper pits and rugae in the male. The apical tibial mucrones are smaller in females of most species. Females average about 0.1 mm longer than males.

The average difference in length of native North American species was 32 percent of the length of the smallest specimen. Environmental conditions, especially size and number of seeds and or larvae per pod, probably influence the size attained by individual specimens.

Color of the integument ranges from light piceous to black. The general color of a specimen is imparted to it by the color of the scales. In *T. stephensi* and *T. tectus*, scale color ranges from light gray to tawny in specimens within a given series. Muka (1955) observed that newly

emerged specimens of *T. stephensi* were yellowish brown and that with age scale color changed in many specimens to pale gray. Specimens of the *T. semisquamosus* species group often exhibit variation in the color of the round or elongate-oval, nonstrigose scales of the elytra and prothorax. These vary from white to dark reddish brown on each specimen. They are usually darkest on interspaces five through seven. The long, narrow, strigose scales on the pronotum and elytra also vary from very light to dark reddish brown in these species.

Specimens may also exhibit variation in the distribution of certain types of scales. In *T. tectus* and *T. liljebladi*, white, round scales on the elytra may be very dense or sparse. The number and uniformity of the median rows of long, narrow, strigose scales on the elytral interspaces may vary, especially in *T. semisquamosus* and *T. lamellosus*, and to a lesser extent in other members of the *T. semisquamosus* species group.

In some species the rostrum from lateral aspect may vary from evenly and prominently arcuate from the base to the apex, to prominently arcuate in the basal portion, and nearly straight to the apex. In other species one extreme or the other may be consistent.

Geographic variation was noted mainly in the overall size of specimens and in the shape, color, and distribution of scales. Where geographic variation was observed, it is described in greater detail in the discussion following the description of the species involved.

### TAXONOMIC CHARACTERS

Color, shape and distribution of scales, shape of the rostrum and structure of the male genitalia, provide good characters for distinguishing species.

Scale color varies from gray as in *T. sordidus* to tawny yellow as in *T. tectus* and a combination of nearly white and reddish brown as in most species of the *T. semisquamosus* species group. The presence or absence of rows of erect or suberect setae on the elytral interspaces is important in separating species groups. Posses-

sion or absence of fine erect setae on the abdomen and metathorax is an important character in separating species.

The relative length of the rostrum in comparison with the prothorax varies. From the dorsal aspect, the rostrum may be wide at the base, becoming acuminate towards the apex as in *T. lamellosus*, or narrow basally and widening at the apex as in *T. sordidus*. Sculpture of the portion distad of the antennal insertion may be shallow or deep.

The shape of the apical portion of the median lobe is an important character for separating closely related species. In its simplest form the apex is more or less evenly rounded or with a slight apical prominence as in *T. sordidus* (Fig. 17), *T. caesius* (Fig. 15), *T. liljebladi* (Fig. 13), *T. tectus* (Fig. 12), *T. soltau* (Fig. 11), *T. phalarus* (Fig. 7), and *T. prolixus* (Fig. 6). In *T. lineellus* (Fig. 16), the apical prominence is greatly exaggerated. In *T. badius* (Fig. 5), *T. montanus* (Fig. 18), and *T. hirsutus* (Fig. 14), the apical portion bears prominent lateral apical prominences. Weak lateral apical prominences are present in *T. aratus* (Fig. 4). In *T. semi-*

*squamosus* (Fig. 9) and *T. lamellosus* (Fig. 8), the apical portion is asymmetrical. Size and shape of the median apical membranous area is important in distinguishing between the closely related species *T. liljebladi* (Fig. 13) and *T. tectus* (Fig. 12), and between *T. soltau* (Fig. 11) and *T. phalarus* (Fig. 7). The median struts may be stout in some species as in *T. badius* (Fig. 5), or very slender as in *T. sordidus* (Fig. 17). The terminal clubs on these structures in some species such as *T. tectus* (Fig. 12) may also be important. Structure of the genitalia of *T. stephensi* (Fig. 10) appears unrelated to any of the native North American species.

### PHYLOGENY

Since most species of *Tychius* occur in the Old World and have not been studied, a detailed discussion of their phylogeny will not be attempted. Some trends are evident however, among the North American species.

The native North American species are divided into two species groups. These are characterized in the discussion following the description of the genus. The *T. sordidus* species group is probably the most primitive. The palearctic fauna contains species which appear to be closely related to this group. In this group *T. sordidus*, *T. caesius*, and *T. lineellus* are relatively large in size with gray scales. The toothed protibia of *T. lineellus* is unique among North American species but some European species possess a similar tooth. Several characters expressed by *T. liljebladi* and *T. tectus* suggest intermediacy between the two species groups. In addition to the long, narrow, strigose scales, *T. liljebladi* possesses a few scattered, round, white, nonstrigose scales on the elytra. *Tychius tectus* usually possesses definite rows of white, round scales on interspace one, near the humeri, and on the pronotum, giving the insect a striped appearance. The general body form in these two species is also intermediate. The body form in *T. liljebladi* is more like the species of the *T. sordidus* species group, whereas *T. tectus* more closely resembles species of the *T. semisquamosus* species group. These two species occur on *Astragalus* as do species of the *T. semisquamosus* species group. The other members of the *T. sordidus* species group occur on species of the plant genera *Baptisia* and *Lupinus*.

The species of the *T. semisquamosus* species group appear to be more distantly related to the palearctic fauna.

Reduction of the rows of long, narrow scales on the elytral interspaces from multiseriate to uniform, median, uniseriate rows, and the development of erect, hairlike setae on the ventral surfaces appear to be important trends within the *T. semisquamosus* species group. *Tychius semisquamosus* and *T. lamellosus* have multiseriate rows of long, narrow scales on the elytral interspaces but lack erect, hairlike setae on the ventral surfaces. This indicates relationship to the *T. sordidus* species group in which the elytral interspaces are clothed exclusively with long, narrow scales. *Tychius badius* appears to occupy a position intermediate between *T. lamellosus* and *T. soltau*. This species has a reduced number of rows of long, narrow scales on the elytral interspaces and also lacks erect hairlike setae on the ventral surfaces.

Structural variation in the male genitalia does not appear to indicate major trends. The asymmetrical apical portion of the median lobe in *T. semisquamosus* (Fig. 9), and *T. lamellosus* (Fig. 8) is unique among the North American species. The apical and lateral prominences on the median lobes of the genitalia of *T. badius* (Fig. 5), *T. montanus* (Fig. 18), and *T. hirsutus* (Fig. 14), may function as isolating mechanisms.

Possession of uniseriate rows of long, narrow scales on the elytral interspaces, the absence of erect, hairlike setae from the venter, and close resemblance to *T. lamellosus* indicates that *T. prolixus*, for which Casey (1910) erected the subgenus *Paratychius*, arose in North America with the *T. semisquamosus* species group. The difference in number of antennal funicular segments does not appear to warrant giving this taxon generic or subgeneric rank.

*Tychius phalaris* appears similar to *T. soltani*, but several characters of the rostrum and vestiture suggest that they are not closely related. This species is associated with the plant genus *Lotus* rather than *Astragalus*.

The trend in the *T. semisquamosus* species group toward refinement of the long, narrow

scales on the elytral interspaces is culminated in *T. hirsutus*; these scales taking the form of very long, white, hairlike setae.

*Tychius aratus* is distinct in many features from the other members of the *T. semisquamosus* species group. Its relationship to the group is uncertain.

## SYSTEMATIC SECTION

### Genus *Tychius* Germar

*Tychius* Germar, 1817, *Magazin der Entomologie* (Germar), 2:340 (Type-species, *Curculio quinquepunctatus* Linnaeus, 1758, by subsequent designation, Schoenherr, 1825:583).

*Paratychius* Casey, 1910, *Can. Entomol.*, 42:135 (Type-species, *Tychius proximus* Casey, by original designation). NEW SYNONYMY.

The genus *Tychius* in North America may have six or seven antennal funicular segments. It is closely allied to *Miccotrogus* Schoenherr, 1825, one species of which, the introduced *M. picrostris* (Fabricius, 1757), occurs in North America. *Tychius* and *Miccotrogus*, in the female, have the elytral apices conjointly rounded concealing the pygidium. Four related genera, *Itychus* Kissinger, 1962, *Paragoges* LeConte, 1876, *Mecynopyga* Pierce, 1908, and *Sibinia* Germar, 1817, each with six antennal funicular segments, occur in North America. These genera all have the elytral apices separately rounded, leaving the pygidium broadly exposed in both sexes.

**Description.** Length 2.0-5.3 mm, female usually 0.1-0.2 mm longer than male; integument light reddish brown to black; appendages and rostrum usually lighter in color than body. Vestiture of gray, yellowish or reddish brown and white scales.

Rostrum longer or shorter than prothorax; in dorsal aspect both nearly parallel from base to apex; apex wider than frons between dorsal margin of eyes, or finely tapered from base to apex. Frons between dorsal margin of eyes as much as 2.5 times wider than rostrum at tip; usually glabrous or with a few elongate scales distad of antennal insertion; antennal insertion at middle of rostrum in female, in distal third or fourth in male.

Antennae with last funicular segment with row of alternately long and short scales.

Pronotum as wide or wider than long; sides usually evenly rounded, slightly constricted apically, wider at base than at apical constrict-

tion. Vestiture of long, narrow scales on dorsum, round or elongate-oval; usually lighter colored scales on ventral portion of lateral surface, often with round or elongate-oval scales on dorsum in median and lateral vittae.

Elytra nearly parallel sided in basal two thirds, humeri not prominent; in lateral aspect either broadly rounded or nearly flat in basal half, declivity evenly rounded; striae deep, punctures even, clearly visible, strial setae fine, hairlike or broad. Vestiture of long, narrow scales of uniform size and shape, or round to elongate-oval, usually broadly imbricated scales with median rows of long, narrow scales on each interspace.

Ventral surface with broadly imbricated, usually white, round to elongate-oval scales; suture between sterna two and three strongly produced posterolaterally, reaching or passing suture between sterna three and four (Fig. 3). Sterna three and four about equal to sternum five in length; sternum five usually with deep median fovea.

Front coxae contiguous, femora usually swollen in apical two thirds, usually with strongly developed apical, ventral emargination; often with minute tooth or spine on proximal portion of apical ventral emargination; vestiture of long, narrow and elongate-oval scales, or elongate-oval scales alone.

Tibiae mucronate, mucro on protibia usually larger and stouter; apex of tibia with uniform row of stout, usually light yellowish brown bristles; vestiture of long, narrow, and round or elongate-oval scales, and elongate, very fine, hairlike setae.

Tarsi with pads of very fine white setae on ventral surfaces, dorsal surfaces with long, narrow scales and fine, hairlike setae; claw with basal process about two thirds length of claw.

Male genitalia with median, usually apical, membranous area; apex of median lobe rounded, or asymmetrical, often with apical, lateral prominences; median struts articulating with

ventral-lateral projections of median lobe; tegmen small, Y-shaped (Fig. 12), not forming ring.

**Discussion.** The native North American species may be divided into two species groups. Species of the *T. sordidus* species group have a simple vestiture in which all scales on the elytra are long, narrow, and strigose, the elytral interspaces lacking discrete rows of setae. The introduced *T. stephensi* is most closely related to this group. The *T. semisquamosus* species group

has a complex vestiture in which the elytral interspaces are clothed with round, usually imbricated, light colored, nonstrigose scales, and multiseriate or uniseriate rows of long, narrow setae.

**Forms included and host records.** A list of the species groups and species of *Tychius* in North America and host plants from which they have been recorded is given below. Synonyms are given in parenthesis following the valid name of each species.

<i>Tychius</i> species	Host Plants
<b>Introduced species</b>	
<i>T. stephensi</i> Schoenherr, 1836 .....	<i>Melilotus</i> spp. <i>Fragaria</i> spp. <i>Crataegus</i> spp. <i>Vicia</i> spp. <i>Trifolium pratense</i> L.
<b><i>T. sordidus</i> species group</b>	
<i>T. sordidus</i> LeConte, 1876 .....	<i>Baptisia leucantha</i> Torr. & Gray
( <i>nimius</i> Casey, 1910)	<i>B. bracteata</i> Muhl.
( <i>texasus</i> Casey, 1910)	<i>B. cuneata</i> Small.
( <i>carolinae</i> Casey, 1910)	<i>B. villosa</i> (Walt.) Ell.
<i>T. caesius</i> , new name .....	None Cited
<i>T. lineellus</i> LeConte, 1876 .....	<i>Lupinus albifrons</i> Benth.
( <i>tacitus</i> Casey, 1910)	<i>L. ammophilus</i> Greene
( <i>hesperis</i> Casey, 1910)	<i>L. argenteus</i> Pursh
( <i>radians</i> Casey, 1910)	<i>L. arborus</i> Sims.
( <i>dilectus</i> Casey, 1910)	<i>L. bicolor</i> Lindl.
( <i>probus</i> Casey, 1910)	<i>L. caudatus</i> Kell.
	<i>L. chamissionis</i> Esch.
	<i>L. excubitus</i> Jones
	<i>L. leucophyllus</i> Dougl.
	<i>L. sericeus</i> Pursh
<i>T. liljebladi</i> Blatchley, 1916 .....	<i>Astragalus canadensis</i> L.
<i>T. tectus</i> LeConte, 1876 .....	<i>Astragalus adsurgens</i> Pallas
( <i>languidus</i> Casey, 1910)	ssp. <i>robustior</i> (Hook.) Welsh
	<i>A. bisulcatus</i> (Hook.) Gray
	var. <i>heydenianus</i> (Gray) Barneby
	<i>A. scopulorum</i> T. C. Porter ex
	Port. & Coult.
	<i>A. tenellus</i> Pursh
	<i>Oxytropis besseyi</i> (Rydb.) Blank
	<i>O. campestris</i> (L.) DC.
	<i>O. lambertii</i> Pursh
	<i>O. sericea</i> Nutt.
	<i>Hedysarum</i> sp.
<b><i>T. semisquamosus</i> species group</b>	
<i>T. semisquamosus</i> LeConte, 1876 .....	None Cited
<i>T. lamellosus</i> Casey, 1892 .....	<i>Astragalus beckwithii</i> T. & G.
	<i>A. drumondii</i> Dougl. ex Hook.
	<i>A. lentiginosus</i> Dougl. ex Hook. var.
	<i>palans</i> (M. E. Jones) M. E. Jones
	<i>A. lonchocarpus</i> Torr.
<i>T. proxilus</i> Casey, 1892 .....	<i>Astragalus amphioxys</i> Gray
( <i>imbricatus</i> Casey, 1910)	<i>A. douglasii</i> Gray
	<i>A. utahensis</i> (Torr.) T. & G.
	<i>A. lentigenosus</i> Dougl. ex Hook.

<i>T. hadius</i> , n.sp.	<i>Astragalus scopulorum</i> T. C. Porter ex Port. & Coult. <i>A. bisulcatus</i> (Hook.) Gray
<i>T. soltau</i> Casey, 1892	<i>Astragalus flavus</i> Nutt. ex T. & G. var. <i>flavus</i> (M. E. Jones) Barneby <i>A. flexuosus</i> (Hook.) Don
<i>T. montanus</i> , n.sp.	None Cited
<i>T. hirsutus</i> , new name	<i>Astragalus nuttallianus</i> A. DC.
<i>T. phalarus</i> , n.sp.	<i>Lotus rigidus</i> (Benth.) Greene
<i>T. aratus</i> Say 1831 ( <i>arator</i> Gyllenhal, 1836)	<i>Astragalus crassicaerps</i> Nutt.

Key to North American species of *Tychius*

- 1 Elytral interspaces bearing long, narrow, strigose scales of uniform size and shape; round, or oval, white scales, if present, not present on all interspaces; dorsal profile of elytra broadly rounded ..... *sordidus* group 2
- 1' Each elytral interspace bearing two distinct types of scales; round to elongate-oval, recumbent, usually broadly imbricated, nonstrigose scales and long, narrow, often fine and setiform, strigose scales in uniseriate or multiseriate, median rows; dorsal profile of elytra straight on disc, broadly rounded to apices on declivity ..... *semisquamosus* group 7
- 2(1) Male with large triangular tooth near middle on ventral margin of protibia; scales generally gray in color, often alternate elytral interspaces with bronze colored scales ..... *lineellus*
- 2' Male without large triangular tooth near middle on ventral margin of protibia, scales gray or yellow in color, not gray and bronze on alternate elytral interspaces ..... 3
- 3(2') All femora with small tooth or spine on proximal portion of apical, ventral emargination; pronotum with sides broadly rounded, widest in about middle; all scales gray or yellowish gray in color ..... *caesius*
- 3' Metafemur often with a small tooth or spine on proximal portion of apical ventral emargination but profemur and mesofemur without tooth; pronotum widest at middle or at base; scales gray or yellow in color ..... 4
- 4(3') Rostrum from dorsal aspect wider at apex than frons between dorsal margin of eyes; pronotum widest at base; scales yellow; yellowish gray, or gray, often lateral margins of individual scales metallic bronze in color; no round white scales on elytra ..... *sordidus*
- 4' Rostrum from dorsal aspect narrower at apex than frons between dorsal margin of eyes; pronotum wider in middle than at base; scales yellow, several round, white scales on elytra ..... 5
- 5(4') Rostrum from lateral aspect prominently swollen at base; acuminate, smooth, with very shallow punctures distad of antennal insertion; round, white scales on elytra sparse, unevenly distributed ..... *liljebladi*
- 5' Rostrum from lateral aspect not prominently swollen at base; portion distad of antennal insertion not acuminate, punctures and rugae deep; round white scales concentrated on interspaces one and around humeri on interspace eight ..... 6
- 6(5) Round, white scales on elytra limited to interspace one, small, 2.0-2.6 mm in length ..... *stephensi*



6'	Round, white scales on elytra on interspaces one and eight, especially dense on humeri, a few scattered scales rarely occur on other interspaces; larger, 2.5-3.8 mm in length .....	<i>tectus</i>
7(1)	Antennal funiculus seven-segmented .....	8
7'	Antennal funiculus six-segmented .....	<i>prolixus</i>
8(7)	Abdominal sterna each bearing a distinct transverse row of erect, hairlike setae; rostrum usually with several round, white, nonstrigose scales on lower portion of sides, or rostrum longer than prothorax .....	9
8'	Abdominal sterna without distinct, transverse rows of erect, hairlike setae; rostrum without round, white, nonstrigose scales on lower portion of sides .....	13
9(8)	Rostrum longer than prothorax, especially in female (Fig. 3); scales unicolorous; length 4.1-4.4 mm .....	<i>aratus</i>
9'	Rostrum shorter than prothorax; insect with white and dark reddish brown scales; length 2.6-3.9 mm .....	10
10(9')	Rostrum distad of antennal insertion acuminate; white scales on dorsum of prothorax forming broad median vitta from base to apex of pronotum .....	11
10'	Rostrum distad of antennal insertion not acuminate, often slightly expanded in dorsal aspect at extreme apex; white scales on dorsum of pronotum, limited to basal median patch .....	12
11(10)	Long, narrow scales on elytral interspaces fine, hairlike, longer than width of interspace, usually lighter in color than round, nonstrigose scales; rostrum distad of antennal insertion finely acuminate; elongate scales on dorsum of prothorax narrow, integument broadly visible; median lobe of male genitalia with lateral, apical prominences (Fig. 14) .....	<i>hirsutus</i>
11'	Long narrow scales on elytral interspaces short, stout, shorter than width of interspace, usually darker in color than round, nonstrigose scales; rostrum distad of antennal insertion evenly tapered, not finely acuminate; elongate scales on dorsum of prothorax broad, integument concealed or only slightly visible; median lobe of male genitalia without apical, lateral projections (Fig. 11) ....	<i>soltaii</i>
12(10')	White scales on dorsum of prothorax forming a large median, basal patch (Fig. 2); metathorax and visible abdominal sternum one with fine, erect, hairlike setae; long, narrow, scales on femur darker than nonstrigose oval, white scales; median lobe of male genitalia without lateral, apical projections (Fig. 7) .....	<i>phalarus</i>
12'	White scales on dorsum of prothorax forming small, median basal patch; metathorax and visible abdominal sternum one lacking fine, hairlike setae; long, narrow scales on femora lighter in color than nonstrigose oval scales; median lobe of male genitalia with weakly developed apical, lateral projections (Fig. 18) .....	<i>montanus</i>
13(8')	Long, narrow scales on elytral interspaces in nearly uniform uniseriate rows; median lobe of male genitalia with well-developed lateral, apical projections (Fig. 5) .....	<i>badius</i>
13'	Long, narrow scales on elytral interspaces in confused, multiseriate rows; median lobe of male genitalia with apical portion asymmetrical, lacking apical, lateral projections (Figs. 8, 9) .....	14
14(13')	Round, nonstrigose scales on elytral interspaces dense, imbricated; distal portion of rostrum finely acuminate; length 2.4-3.4 mm .....	<i>lamellosus</i>
14'	Round, nonstrigose scales on elytral interspaces sparse, rarely imbricated; distal portion of rostrum not finely acuminate; length 2.3-2.7 mm .....	<i>semisquamosus</i>

*Tychius stephensi* Schoenherr

(Figs. 10, 20)

*Curculio picirostris* Fabricius, 1787, *Mantissa insectorum*: 1:101 (Holotype: "Hafniae Dom. Lund." Copenhagen Museum, Fabricius collection); Paykull, 1792, *Monographia curculionum Sueciae*, p. 63.

*Curculio fuscirostris* Paykull, 1792, *Monographia curculionum Sueciae*, p. 62 (see discussion for information on the "type").

*Curculio tomentosus* Herbst (not Olivier, 1790), *In: Jablonsky, 1795, Natursystem aller bekantten in und auslaendischen insecten . . . . kaefer*, 6:278, Tab. 81, Fig. 7 (Lectotype here designated: female, "Deutschland", Zoologisches Museum, Berlin, 54577).

*Rhynchacnus picirostris*: Gyllenhal, 1813, *Insecta Suecica . . . .*, 1(3):121.

*Tychius picirostris*: Germar, 1817, *Magazin der Entomologie (Germar)*, 2:340.

*Tychius tomentosus*: Stephens, 1829, *Systematic catalogue of British insects. . . .*, p. 160.

*Tychius stephensi* Schoenherr, 1836, *Genera et species curculionidum. . . .* 3:412 (Lectotype here designated: Female, "Anglia." British Museum Natur. Hist., J. F. Stephens collection).

*Tychius stephensi*: Stephens, 1839, *A manual of British coleoptera, or beetles. . . .*, p. 229 (Emendation of *stephensi* Schoenherr).

*Miccotrogus picirostris*: Casey, 1892, *J. New York Entomol. Soc.*, 6:411-412.

*Tychius brevicollis* Rey, 1895, *Echange*, 11:3 (types not seen, synonymy from Klima, 1934:25).

*Tychius clavipes* Rey, 1895, *Echange*, 11:3 (types not seen, synonymy from Klima, 1934:26).

*Tychius mixtus* Rey, *Echange*, 11:4 (types not seen, synonymy from Klima, 1934: 26).

*Tychius griseus* Schaeffer, 1908, *J. New York Entomol. Soc.* 16:217-218 (Holotype: male, Ithaca, New York, USNM, type 42484).

This is the red clover seed weevil of North American economic literature. It was probably introduced into North America from Europe. It closely resembles *T. tectus* and *T. hiljebladi* in several characters but differs by its smaller size, by the structure of the male genitalia (Fig. 10), and by its host preferences. It also closely resembles *Miccotrogus picirostris* (Fabricius) but can easily be distinguished by the seven- rather than six-segmented antennal funiculus and other characters enumerated by Milliron (1949). Muka (1955) studied the biology of *T. stephensi* and Takenouchi (1965) described the chromosomes of *T. stephensi* and *M. picirostris*.

**Description.** *Male:* Length 2.0-2.5 mm, width 0.9-1.2 mm; integument black to dark reddish brown, appendages light reddish brown. Vestiture on appendages, thorax and elytra of

long, narrow, light yellowish brown scales, ventral surface with white scales.

Rostrum shorter than prothorax, moderately, evenly arcuate, slightly tapered to apex. Frons slightly wider between dorsal margin of eyes than rostrum at apex. Integument distad of antennal insertion smooth and shining, rugae very deep, especially laterally; glabrous except for sparse fine setae on extreme tip. Scales proximad of antennal insertion of uniform size, shape and color, parallel sided, truncate to rounded at apices.

Antennal funicle seven-segmented, pedicel longer than next three segments combined.

Prothorax 1.2 times wider than long, sides broadly, evenly rounded, slightly constricted at apex, less than two times as broad at base than at anterior margin. Scales on dorsum of uniform size, shape, and color, long, narrow, rounded at apices; scales on lateral surface round to elongate-oval; long, narrow scales of dorsum ending abruptly about one-fourth of the way down sides, not intermingled with round or elongate-oval scales on sides.

Elytra with sides broadly rounded; dorsal profile broadly rounded, not flat in basal third. Scales on dorsum slightly broader than those on dorsum of prothorax. Interspace one usually with distinct row of round, white, nonstrigose scales extending entire length; round, nonstrigose scales absent from other interspaces. Strial setae narrow, light colored on dorsum, broader and darker in color laterally.

Ventral surface with dense, slightly imbricated, round to oval, white scales, often with plumose margins; elongate, hairlike setae absent. Sternum five lacking median fovea.

Femora with ventral apical, emargination weakly developed, no minute tooth on proximal portion of emargination. Scales of uniform size and shape, similar to scales on elytra and prothorax. Tibiae mucronate, mucro on protibia largest; vestiture of long, narrow scales and fine hairlike setae, no round, nonstrigose scales.

Male genitalia (Fig. 10), with median lobe stout, strongly curved in lateral aspect, median dorsal membranous area large, extending nearly to proximal portion of median lobe, with row of sclerotic inclusions on each side; median struts stout, finely tapered.

Female: length 2.0-2.6 mm. Rostrum more finely tapered, antennal insertion slightly distad of middle.

**Hosts.** Recorded by Muka (1955): In Europe from *Melilotus*, *Fragaria*, *Crataegus*, and *Vicia*, and red clover, *Trifolium pratense*; in North America from *Trifolium pratense*.

**Distribution.** (Fig. 20).

Alberta: Edmonton, V-14-21, H. W. Wenzel, 1 male, 2 females (OSC).

Arizona: Globe, III, D. K. Duncan, 1 male, 2 females (CU).

British Columbia: Chilliwack, VI-15-53, G. J. Spencer, 1 female (CNC).

Colorado: Bellvue, 13 mi. W., Buckhorn Mts., 8500', VI-22-66, S. G. Wellso, 1 male (TAM).

Connecticut: Canaan, VI-12-28, L. B. Woodruff, 2 males, 2 females (AMNH); Cornwall, IV, V, VI, VII-28, 29, 8, 15, 6, 10, 11-20, 21, 22, 24, Chamberlain, 4 males, 3 females (CU), 3 males, 2 females (CAS), 1 male (USNM); Littlefield, V-30-13, L. B. Woodruff, 1 male (AMNH); New Haven, V-23-19, Chamberlain, 1 male, 1 female (CU); Westport, V-28-31, L. Lacey, 1 female (BYU).

Illinois: Hebron, VII-29-52, C. E. White, red clover, 1 male (INHS); Lombard, VII-29-52, C. E. White, mixed red clover, alfalfa, ragweed, 1 male (INHS); Plainfield, VII-30-52, C. E. White, red clover, 1 female (INHS); Yorkville, VII-30-52, C. E. White, red clover, 1 female (INHS).

Indiana: Decatur, F. W. Poos, red and white clover, 3 males, 1 female (USNM).

Maine: Cumberland Co., VI, VII-1, 26-16, A. Nicolay, 3 males (BYU); Bridgton, VIII-20-34, M. E. Griffith, 1 female (UK); Lincoln Co., VIII-20-40, D. J. Borrer, 1 female (OSC); Medomak, VII-4-38, 1 male (OSC); Millinocket, VII-27-30, C. G. Siepmann, 3 males, 3 females (OSU); Orono, VIII-19-18, H. Osborn, 1 female (OSC); Weld, VII-2-51, A. Stone, 1 female (USNM).

Maryland: Montgomery Co., Great Falls, VI-25-63, D. C. and K. A. Rentz, 1 male (CAS); Raspeburg, IV-14-43, Schaeffer, red clover, 5 males, 2 females (USNM).

Massachusetts: 1 male (BYU); Ashland, VI-18-51, C. A. Frost, 1 male, 1 female (ISU); Fall River, VI-1, 20-19, 34, N. S. Easton, 3 males, 3 females (MCZ); Harwichport, VIII-33, L. Lacey, 1 male, 2 females (BYU); Hopkinton, VI-1-13, 1 male, 1 female (BYU); Marblehead, VIII-26-30, H. Dietrich, 1 female (CU); Salisbury, VI-11-28, H. Dietrich, 1 male, 2 females (CU); Sherborn, VI-6-25, C. A. Frost, 1 male, 1 female (BYU); Sherborn, VI-1, C. A. Frost, 2 females (PANS); Wilmington, VI-26-20, C. C. Speery, 1 female (USNM); Woods Hole, VII-11-19, L. L. Buchanan, 1 female (CU).

Michigan: Sheboygan, VII-14-41, H. B. Hungerford, 1 male (UK); Sheboygan, VII-1-42, E. L. Todd, 1 male (UK); Sheboygan, VII-2-51, D. M. Anderson, 1 female (CIS); VII, 23, 27, 29-51, E. P. Marks, 23 males, 22 females (CIS); Ingram Co., VII-23-47, 1 male (USNM); Missaukee Co., VII-14-45, R. R. Dreisbach, 1 female (UA).

Minnesota: St. Paul, VI-19-48, II, E. Milliron, red clover, 1 male (USNM).

New Brunswick: Halcomb, VIII-9, 11, 14-51, E. E. Gilbert, 2 males, 4 females (CIS).

New Hampshire: Mt. Washington, VII-6-14, C. A. Frost, 1 male (INHS); Peabody River, White Mts., VII-11-25, A. Nicolay, 1 male (USNM); VII-11-25, E. D. Quirsfeld, 2 males, 3 females (UA); Valley Meadow, White Mts., VII-11-25, F. R. Mason, 900', 2 males, 2 females (PANS).

New Jersey: Haddon Hts., IV-29-35, L. J. Bottimer, 2 males, 2 females (CNC); Irvington, A. Bischoff, 1 male (USNM), 1 male (AMNH); Montclair, E. D.

Quirsfeld, 2 males, 1 female (CAS), Bischoff, 1 female (AMNH); Palisades, VI-22-39, Malkin, 1 male, 2 females (FMNH); Philtosburgh, V, VI-12, 20-17, 31, J. W. Green, 1 male, 1 female (CAS).

Nova Scotia: Digby Co., VI-27-58, C. V. Reichart, 1 male (OSC); Sidney Mines, VI-19-65, W. J. Brown, 1 male, 1 female (CNC).

New York: Austerlitz, VI-25-34, H. Dietrich, 1 male (CU); Bear Lk., VI-2-40, 3 females (FMNH); Bridgeport, V-20-14, 8 males, 7 females (USNM); Canton, VI-19-25, Bably, 1 female (CU); Crosby Landing, VI-26-14, L. Kenke, 1 male (CU); Croton Falls, IV-26-40, 1 male, 2 females (FMNH); Crown Pt., VI-26-34, H. Dietrich, 1 female (CU); Greenport, VII, VIII-63, R. Latham, 1 female (CU); Hancock, VI-18-34, H. Dietrich, 1 female (CU); Ithaca, VII-8-07, 1 male (FMNH), V, VI-18, 2-14, 15, 2 males, 1 female (AMNH), VI-2-15, 5 males, 5 females (BYU), V-30-14, 1 male (USNM); III, IX-14-20, 6 males, 8 females (CU), V, VII-3, 24-17, 19, H. Dietrich, 2 females (OSU), 1 female (CU), VIII-31-15, C. W. Leng, 2 females (BYU); Renwich, VI-2-19, 1 male, 1 female (CU); H. Morrison, VI-1-13, 1 female (TAM); Courtland Co., Labrador Lake, VI-4-38, J. C. Bradley, 1 male, 1 female (CU); Cape Hopafrieng, VI-9-40, 3 females (FMNH); Lancaster, VII-25-46, L. D. Beamer, 1 male (UK), McLean, VII-2, 3-04, 1 male (CU); Tompkins Co., McLean Bogs, V-30-19, H. Dietrich, 1 female (CU); Minetto, VI, VIII-1-52, A. A. Muka, 36 males, 41 females (CU); 6 males, 20 females (OSU); VIII-52, 1 female (USNM); Oliverea, VI-18-34, H. Dietrich, 2 males, 4 females (CU); Oswego, VII-2, 16, 19-1896, 4 males, 5 females (CU); Paulsmith, VI-19-25, Bably, 2 males (CU); Pelham, VI-7, 2-30, 34, Lacey, 1 male, 2 females (BYU); Penn Yan, VII-12-25, Bably, 1 female (CU); Perry, VII-31-19, 1 male, 1 female (CU); Clinton Co., Peru, VI-10-16, 3 females (CU); Peterburg, VI-25-34, H. Dietrich, 1 female (CU); Phoenicia, VI-30-35, J. W. Green, 1 female (CAS); Port Jarvis, VI-6-56, M. Playter, alfalfa, 1 female (CU); Pulaski, VI-20-25, Bably, 2 females (CU); Rochester, V-14, M. D. Leonard, 1 female (LA); 2 males, 2 females (CU); Salem, VI-26-34, H. Dietrich, 2 females (CU); Slaterville, V-27-38, J. C. Bradley, 1 female (CU); Sonyea, VI-22, 1 male (CU); Cayuga Co., Springlake, VII-23-18, 1 male (CU); Stony Island, VII-8-96, 2 females (CU); Staatsburg, VI-23-34, H. Dietrich, 2 males, 1 female (CU); Ticonderoga, VII-3, F. R. Mason, 1 male (PANS); Tuxedo, V-26-40, 1 female (FMNH); Van Cortland Park, V, VI-9, 23, 26-39, 2 males, 3 females (FMNH); West Point, VI-3-12, W. Robinson, 1 female (CU).

OHIO: Adams Co., VIII-20-67, R. and L. Hamilton, 1 female (OSC); Clinton Co., VI-10-61, F. J. Moore, 2 males, 2 females (OSC); Columbus, VI-8-64, Hamilton and Black, 2 females (OSC); Wayne Co., Daes, V-3-60, alfalfa and clover, 1 male (OSC); Delaware Co., IV, V, VII, VIII-13, 2, 30, 4, 9, 56, 65, 66, 67, 68, R. and L. Hamilton, 6 males, 9 females (OSC), VII-4-66, E. Sims, 1 male (OSC); Franklin Co., V-10-67, R. and L. Hamilton, 1 female (OSC); Greene Co., VI-2-59, D. J. and J. N. Knull, 1 male (OSC); Highland Co., V, VI-2, 18, 3-61, 67, 68, R. and L. Hamilton, 3 males, 1 female (OSC); Hocking Co., V-30-64, Hamilton and Black, 1 female (OSC); V-4-68, R. and L. Hamilton, beaten from *Prunus virginiana*, 1 male, 1 female (OSC); V-2-57, D. J. and J. N. Knull, 1 male (OSC); Clear Fork Valley, VI-5-66, R. and L. Hamilton, 1 male (OSC); Licking Co., VII-30-47, Ladino red clover, 5 males, 3 females (OSU); Pike Co., V-12-63, R. E. White, 4

males, 1 female (OSC), Strongsville, VI-30-20, W. H. Larrimer, 1 male, 1 female (USNM); Vinton Co., IV-15-67, R. and L. Hamilton, 1 female (OSC); Wood Co., VII-30-47, red clover, 2 males (OSU); Madison Co., V-27-67, R. and L. Hamilton, 1 male, 1 female (OSC).

Ontario: Prince Edward Co., V-14, 23-20, 21, Brimley, 4 females (UK), 1 male 9 females (CAS); Ottawa, V-20-50, H. F. Howden, 1 male, 1 female (CNC); VI-18-16, 1 male, 1 female (CU); Rideau Lk., VII-17, F. R. Mason, 1 male (PANS).

Pennsylvania: Downingtown, VII-4-35, L. J. Bottimer, 1 male (CNC); Duncannon, V-8-40, F. W. Poos, 1 female (USU); Easton, VI, VII-3, 4-30, 26, J. W. Green, 2 females (CAS); Elfort, VI-6-31; J. W. Green, 1 female (CAS); Greentown, VI-16-20, D. E. Quirsfeld, 1 male, 6 females (UA); Hummelstown, V-20-25, J. N. Knull, 1 male (PANS); New Hope, V-30-35, L. J. Bottimer, 3 males, 1 female (CNC); Nottingham, V-10-36, L. J. Bottimer, 1 male (CNC); Milford Pike Co., V, VI-30, 1-11, B. Malkin, 3 females (FMNH); North East, VI-11-17, R. H. Cushman, red clover, 1 female (USNM); Snyder Co., IX-4-41, J. O. Pepper, clover seed heads, 2 females (USNM); Spring Bridge, V-26-45, 1 male (USNM); Wilawana, VI-12-39, R. H. Crandall, clover, 2 females (UA); Wind Gap, V, VI-28, 18-31, J. W. Green, 7 males, 4 females (CAS).

Quebec: Ayler, V-31-28, W. J. Brown, 1 male, 1 female (UK); VI-19-36, G. Stacesmith, 3 males, 5 females (CAS); Chelsea, VI-20, 25-16, 1 male, 1 female (CU); Covey Hill, VI-27-24, C. E. Petch, 1 male (CNC); Déparquet, V-27-44, G. Stacesmith, 1 male, 1 female (CAS); Gaspé, 25 mi. W., VI-22-54, W. J. Brown, 1 male (CNC); Georgesville, VI-23, 36, G. S. Walley, 1 female (CNC); Hull, VI-19, 23-16, 1 female (CU); V-31-54, W. J. Brown, 2 males (UK); 1 male, 3 females (AMNH); Megantic, VII-6, 7-16, 1 female (CU); Laurentian Mts., Montfort, VI-30-16, 1 female (CU); Montreal, V-31-19, E. S. Ross, 1 male (AMNH); Perkins' Mills, VI-23-36, G. Stacesmith, 1 male, 1 female (CAS); Sherbrooke, VII-5-16, 1 male (CU); Ste. Anne's, VI-12-15, Webster, 1 male (USNM); St. Lambert, VII-4-27, W. J. Brown, 1 female (CNC).

Rhode Island: VI-7-51, red clover, 2 males (USNM); Arawan Cliffs, VII-3-50, C. V. Reichart, 1 male (OSC).

Vermont: Chelsea, VI-16, H. E. Smith, 1 male (USNM).

Virginia: Arlington, IV-9-37, F. F. Dicke, 1 male (USNM); 1 female (OSC).

Washington: Bellingham, VI-4-45, M. J. Forsell, red clover, 1 female (USNM); 3 mi. N., III-3-60, G. G. Scudder, 2 females (OSU).

Wisconsin: Racine Co., Dover, VII-10-66, alfalfa, 1 male (USNM); Walworth Co., Geneva, VIII-4-66, alfalfa, 1 female (USNM); Green Co., Jefferson, VIII-4-66, alfalfa, 1 female (USNM); Kanosha Co., Randall, VII-7-66, alfalfa, 1 female (USNM).

Total specimens examined: 547

**Discussion.** The nomenclature of two closely related weevil pests of cultivated clover was the subject of a paper by Milliron (1949). He determined that one of the species which possesses seven antennal funicular segments belongs to the genus *Tychius*. The correct name of this species was determined to be *T. stephensi* Schoenherr. He stated that the other species which possesses six antennal funicular segments

belongs to the genus *Miccotrogus*. The correct name for this species was determined to be *M. picirostris* (Fabricius). Since then these names have been in use for the two weevils in the literature of North American economic entomology.

Milliron's determination of the nomenclature of these species was made without recourse to the type specimens. During the course of this revision I have examined the types and other material which relate to this problem. These were borrowed from the European museums in which they are preserved. The identity of other type specimens has been ascertained through correspondence with Dr. R. T. Thompson of the British Museum (Natural History) and Per Inga Persson of the Stockholm Museum of Natural History. Examination of this material has revealed that the current application of the two names in question is incorrect.

For convenience of discussion the synonymy revealed by reference to the types is listed below. The names listed under *Tychius* conform to the current concept of *T. stephensi* Schoenherr. Those listed under *Miccotrogus* conform to the current concept of *M. picirostris* (Fabricius).

#### *Tychius*

- Curculio picirostris* Fabricius, 1787
- Curculio fuscirostris* Paykull, 1792?
- Curculio tomentosus* Herbst, 1795
- Tychius stephensi* Schoenherr, 1836
- Tychius griseus* Schaeffer, 1908

#### *Miccotrogus*

- Curculio cinerascens* Marsham, 1802
- Tychius posticus* Gyllenhal, 1836

Dr. Thompson reported that specimens of *T. stephensi* from the British Museum (Natural History) and the type of *Curculio picirostris* Fabricius in the Copenhagen Museum were compared by Dr. B. D. Valentine at Dr. Thompson's request and determined to be conspecific.

According to Persson there are no specimens in the Paykull collection at the Stockholm Museum of *C. fuscirostris* Paykull. Paykull (1800) lists *fuscirostris* under *C. picirostris*. Apparently Paykull thought that the name was incorrectly applied and either removed the specimen or specimens from his collection or placed them with his specimens of *C. picirostris*. I have examined a series of five specimens labeled *C. picirostris* from the Paykull collection. These all conform to the current concept of *T. stephensi*. I can find no evidence for linking *fuscirostris*

with *Miccotrogus* under which it is listed by Klima (1934).

The lectotype designated above for *T. tomentosus* Herbst is a female, the first specimen of a series of eight syntypes received from the Zoologische Museum der Humboldt-Universität, Berlin. This specimen and the second, third, fifth, seventh, and eighth conform to the current concept of *T. stephensi* Schoenherr. The fourth is a *Tychius* which is unfamiliar to me and the sixth conforms to the current concept of *M. picirostris* (Fabricius). The name *tomentosus* is in current use in Europe for the *Tychius* species but Milliron (1949) rejected it because it is a junior homonym of *Curculio tomentosus* Olivier, 1790.

Schoenherr (1836) gave the name *T. stephensi* to the species described by Stephens (1831) as *T. tomentosus*. Schoenherr apparently considered it to be a new species only on the basis of Stephens' description and had no specimens in his collection. According to Thompson there are nine specimens identified as *T. tomentosus* in the Stephens' collection. The first of these which I have examined bears the label by the late Sir Guy Marshall: "Type of *T. stephensi* Schönh. (em) 1836." I have designated this specimen as lectotype of *T. stephensi*. According to Thompson all of the series agree with the current concept of *T. stephensi* except the fifth, which is an *Elleschus bipunctatus* (L.), and the sixth, which agrees with the current concept of *M. picirostris* (Fabr.).

Schoenherr's original spelling of the name was *stephensi*. This does not qualify as a *lapsus calami* as it is also spelled *stephensi* in the index to his 1836 work. Stephens (1839) was the first to use the spelling *stephensi* which is in current use today.

I also examined the type of *T. griseus* Schaeffer at the U.S. National Museum. There is no question on its synonymy with *T. stephensi*.

The only types which were found to agree with the current concept of *Miccotrogus picirostris* were those of *Curculio cinerascens* Marsham and *Tychius posticus* Gyllenhal. The identity of *cinerascens* was confirmed by Thompson who states that its type is in the Stephens collection. I examined the type of *T. posticus* from the Stockholm Museum.

Thompson also checked the type of *C. villosus* Marsham which Klima (1934) lists in synonymy with *T. tomentosus*. The type is in the Kirby collection and is a *Sibinia potentillae* Germar, under which species it is also listed by Klima.

The early workers knew the identity of Fabricius' *C. picirostris*. I have examined the specimens described by Paykull (1792:253) as

*C. picirostris* Fabr. These conform to the current concept of *T. stephensi* Schoenherr. Gyllenhal (1813:121) considered his *Rhynchaenus picirostris* to be the same as *R. picirostris* Fabr. 1801, Paykull's *C. picirostris*, and *C. tomentosus* Herbst. Germar (1817:340) cited *tomentosus* Herbst in synonymy with *picirostris*. Stephens (1829:160) listed Paykull's *picirostris* as synonymous with *R. picirostris* Gyllenhal and later (1839:228) listed *tomentosus* Herbst, *T. stephensi* Schoenherr, and Paykull's *picirostris* as synonyms.

The association of Fabricius' *picirostris* with the name *Miccotrogus* came about as the result of a mistake made by Schoenherr. Germar apparently did not consider *C. picirostris* Fabr. 1787 to be the same as *R. picirostris* Fabr. 1801. He (1824:291) associated *R. picirostris* with the generic name *Sibinia* and listed *R. picirostris* "var. b" Gyllenhal in synonymy. The following year Schoenherr (1825:583) listed Gyllenhal's *picirostris* under *Tychius* and under his newly established subgenus *Miccotrogus* listed *Sibinia picirostris* Germar and *R. picirostris* "var. Gyll" (presumably referring to the "var. b") thus associating the specific name *picirostris* with *Miccotrogus* for the first time. Schoenherr (1836:111) then correctly associated Paykull's *picirostris* with Gyllenhal's *picirostris* "var. a" and then listed Gyllenhal's *picirostris* "var. b," which he considered to belong to *Miccotrogus*, in synonymy with *C. picirostris* Fabricius. Later workers and catalogers copied Schoenherr's error thus establishing the usage of Fabricius' *C. picirostris* for the *Miccotrogus* species instead of the *Tychius* species to which its type belongs.

Apparently Fabricius' *Curculio picirostris* and his *Rhynchaenus picirostris* are not the same species. Dr. Thompson reports that Dr. Valentine saw a specimen in the Fabricius collection, labeled *Rhynchaenus picirostris*. He noted that this specimen was a tychiine, but "much larger than *T. stephensi*."

I have examined Gyllenhal's specimens of *R. picirostris* including the "var. b" from the Gyllenhal collection at Uppsala, Sweden. There are 16 specimens of "var. a," all of which conform to the current concept of *T. stephensi*. Of the series of ten specimens designated as *R. picirostris* "var. b" nine are *T. stephensi*. Only one conforms to the current concept of *M. picirostris* (Fabr.).

According to the synonymy revealed in this study the name *picirostris* Fabricius should replace *stephensi* Schoenherr for the *Tychius* species described above. The name *cinerascens* should replace *picirostris* for the *Miccotrogus*

species. I have decided to retain the current usage of the names in question; however, since I do not consider that the changes indicated would be in the interest of stability of nomenclature, I intend to appeal to the International Commission on Zoological Nomenclature to use its plenary powers to such extent as may be necessary to provide a valid basis for the continued use of the names *Tychius stephensi* Schoenherr, 1836, and *Miccotrogus picirostris* (Fabricius, 1787) as they are currently applied.

*Tychius sordidus* LeConte

(Figs. 17, 20)

*Tychius sordidus* LeConte, 1876. Proc. Amer. Philos. Soc., 15:217 (Holotype: male, Illinois, MCZ type 5232); Casey, 1892. Ann. New York Acad. Sci., 6:414; Sanderson, 1904. Tex. Agr. Exp. Sta. Bull., 74:3-13; Hunter and Hinds, 1904. USDA Bur. Entomol. Bull., 51; Mitchell and Pierce, 1911. Proc. Entomol. Soc. Wash., 13:45-62; Pierce, 1907. Entomol. News, 18:362; Pierce, 1907. Stud. Zool. Lab. Univer. Nebr., p. 273; Casey, 1910. Can. Entomol., 42:134-135; Pierce, 1912. USDA Bur. Entomol. Bull., 100:77; Blatchley and Leng, 1916. Rhynchopora or weevils of northeastern America, p. 245; Frost, 1945. J. New York Entomol. Soc., 53:221.

*Tychius nimius* Casey, 1910. Can. Entomol., 42:134 (Holotype: male, Iowa, USNM 36751, T. L. Casey collection).

*Tychius texanus* Casey, 1910. Can. Entomol., 42:134 (Holotype: female, Haw Creek, Texas USNM 36752, T. L. Casey collection).

*Tychius carolinac* Casey, 1910. Can. Entomol., 42:134-135 (Holotype: female, Southern Pines, North Carolina, IX, A. R. Mance, USNM 36750, T. L. Casey collection).

*Tychius sordidus carolinac*: Blatchley and Leng, 1916. Rhynchopora or weevils of northeastern America, p. 245-246.

*Miccotrogus sordidus*: Klima, 1934. *Colcopterorum Catalogus*, 29(138):32.

This is the largest North American species. It can be distinguished from other North American species by its size, its gray or yellowish gray color, its obese shape, and the shape of the pronotum which is wider at the base than at the apex. It closely resembles *T. caesius* and *T. lincellus*. From the former it can be distinguished by the broad prothorax and the absence of a minute tooth on the pro- and mesofemora; from the latter by the absence of a triangular median tooth on the protibia and the absence of the apical projection of the median lobe of the male genitalia (Fig. 17).

Notes on the biology of this species are given by Sanderson (1901), Pierce (1907a, 1907b),

1912), Mitchell and Pierce (1911), Blatchley and Leng (1916), and Frost (1945).

**Description.** Male: length 3.0-4.9 mm, 1.8 times longer than wide; integument shining black on dorsum often piceous to black on ventral surface; appendages dark reddish brown. Vestiture of gray to yellowish gray scales often with metallic bronze margins.

Rostrum shorter than prothorax; from lateral aspect nearly straight to antennal insertion then tapered slightly to apex; in dorsal aspect wider at apex than frons between eyes; dorsoventrally flattened distad of antennal insertion, without dorsal depression between scrobal apices, rugae deep. Vestiture sparse, composed of long, narrow, apically truncate scales; apical portion glabrous except for row of bristles extending nearly to apex from beneath apical portion of scrobe distad of antennal insertion.

Antennal funiculus seven segmented, pedicel longer than next two segments combined.

Prothorax 1.2 times wider than long, widest at base, base more than twice as wide as apex from dorsal aspect. Scales on dorsum of uniform size, shape and color, long, narrow with rounded apices, broader than scales on elytra; scales on lower half of sides round to elongate-oval.

Elytra with sides broadly rounded, widest just before middle; strongly convex in dorsal profile. Scales on dorsum of same shape and color as those on pronotum; usually denser on interspace one but scales of other interspaces of similar size and density. Strial scales slightly, if at all, narrower than scales on interspaces. Interspaces nine and ten with rounded scales similar to those on venter.

Ventral surface clothed with dense, imbricated, round to elongate-oval, white or light gray scales.

Femora stout, especially apically; ventral, apical emargination prominent, usually with small tooth on posterior portion of emargination. Scales of two distinct types, long, narrow, strigose scales and broad scales with rounded sides.

Tibiae mucronate, mucrones on protibia slightly larger than on mesotibia and metatibia. Vestiture of long, narrow, strigose scales, and very fine hairlike setae.

Tarsi with long, narrow scales and fine hairlike setae on dorsal surface. Claws long, divergent, basal processes convergent.

Male genitalia (Fig. 17) with apical portion of median lobe slightly angulate; apical, dorsal, median membranous area nearly round, strongly

defined posteriorly; median struts very fine, not clavate.

Female: length 3.7-5.3 mm, rostrum slightly longer and more slender, especially distad of antennal insertion, antennal insertion median.

**Hosts.** *Baptisia leucantha*, and *B. bracteata* (Blatchley and Leng, 1916:245; Pierce, 1907-a: 273; Pierce, 1907-b:362; Frost, 1945:221), *B. cuneata* (Mitchell and Pierce, 1911:61-62); *B. villosa*. Also recorded from *Acerates* and *Croton*.

#### Distribution. (Fig. 20)

Arkansas: 1 male (USNM); "southwestern," Palm, 2 males, 1 female (AMNH).

Illinois: 2 males (USNM); F. Blanchard, 2 females (MCZ); Liebeck, 1 male (MCZ); Pana, VII-20-38, J. H. Bigger, *Acerates*, 7 males, 5 females (INHS); "southern," 1 male (PANS); F. C. Bowditch, 1 male, 1 female (MCZ).

Iowa: W. G. Dietz, 3 males (MCZ); Horn, 1 male, 1 female (PANS); Burlington, Liebeck, 2 males, 1 female (MCZ); Ft. Madison, 2 males (UK).

Kansas: 2 males, 3 females (PANS); Douglas Co., F. H. Snow, 1 female (UK); Kansas Co., Liebeck, 1 male, 2 females (MCZ); Chautauqua Co., Niotazi, 2 mi. E., VI-3-68, D. R. Harris, 3 males, 1 female (WEC); Onaga, V-20-01, F. C. Bowditch, 1 female (MCZ), VI-27-03, Crevacoer, 1 male, 1 female (UK), 1 female (USNM); Jefferson Co., 8 mi. N. Lawrence, VII-8-65, J. B. Karen, 1 male (CWO).

Louisiana: Logansport, (Pierce, 1907-a:273; 1907-b: 362), Natchitoches, III-28-07, Cushman and Pierce, *Baptisia leucantha*, 6 males, 9 females (USNM); Natchitoches, III-28-07, Pierce, *Baptisia villosa*, 1 female (USNM).

Michigan: Adrian, Liebeck, 1 male, 1 female (MCZ).

New Jersey: Cape May Co., Woodbine, 1 mi. E., VI-21-66, D. G. Kissinger, *Baptisia*, 5 males, 2 females (WEC).

New York: Bellport, Long Island, VII-18-14, A. Nicolay, 2 males (BYU).

North Carolina: Southern Pines (Blatchley and Leng, 1916:246).

Oklahoma: Okfuskee Co., VI-31-34, Hinton, 1 male (BYU); Stillwater, V-3-31, H. Whitaker, 2 males, 3 females (BYU).

Texas: 2 males (INHS); F. H. Chittenden, 2 males, 2 females (USNM); Horn, 1 female (PANS); Liebeck, 2 males (MCZ); Brazos Co., College Sta., III-18-64, J. C. Schaffner, 9 males, 6 females (TAM), IV-3, II-70, on *Baptisia*, 62 males, 45 females, W. E. Clark (WEC). IV-27-50, II. J. Reinhard, 1 male (TAM); Colorado Co., IV-7-22, G. Wiley, 1 male (UK); Eagle Lake, IV-12-1899, A. M. Wangh, 1 male (USNM); Edna, III-24-07, J. D. Mitchell, 1 male, 3 females (USNM); Anderson Co., Elkhart, 10 mi. S., III-27-67, H. R. Burke, 3 females (TAM); Grand Saline, III-25-04, W. D. Hunter, 1 female (USNM); Houston, IV-1-04, G. W. Curtis, 1 female (USNM); Jackson Co., III-25-07, J. D. Mitchell, 1 male (USNM); Keechi IV-4-22, 1 male (TAM); Kirbyville, III-20-08, E. S. Tucker, *Croton* and *Baptisia*, 6 males, 7 females (USNM); Leon Co., IV-10-48, J. L. Ward, 1 male (USNM); Maud, IV-29-41, D. J. and J. N. Knull, 2 males (OSC); Panola Co., IV-15-05, J. Johnson, *Baptisia*, 2 males, 4 females (USNM); Swiss Alps,

III-24-1899, Hubbard and Schwarz, wild pea, 5 males, 10 females (USNM); Tenaha, III-23-08, E. S. Tucker, *Baptisia*, 3 males, 1 female (USNM); Timpson, III-25-08, E. S. Tucker, *Baptisia*, 2 males, 2 females (USNM); Victoria, III-25, 29, 30-05, W. E. Hinds and E. S. Tucker, *Baptisia* and Flowers of "Bull Weed," 5 males, 5 females (USNM); Whitewright, IV-15-08, J. W. Henry, 3 females (USNM); Yoakum, III-27-1899, Roos Bros., *Baptisia bracteata*, 2 males, 8 females (USNM); Fayette Co., LaGrange, III-30-70, on *Baptisia*, W. E. Clark, 4 males, 5 females (WEC).

Total specimens examined: 307.

**Discussion.** Specimens of this species from adjacent localities or from the same series may be entirely gray in color or have several scales with bronze margins giving a general yellowish hue. Specimens from the eastern and southern portion of the range average smaller in size than those from the northern and western portion. Specimens from New Jersey averaged 3.65 mm in length, those from Arkansas 3.85 mm, Louisiana 4.30 mm, Texas 4.30 mm, Iowa 4.40 mm, Michigan 4.60 mm, Kansas 4.55 mm, and Illinois 4.70 mm.

#### *Tychius caesius*, new name

(Figs. 15, 20)

*Tychius armatus* Green (not Tourmier, 1873), 1920, Entomol. News, 31:198 (Holotype: female, Graybeard Mountain, North Carolina, CAS).

*Sibinia armata*: Klima, 1934, *Colcopterorum Catalogus*, 29(138):45.

This species appears to be most closely related to *T. sordidus*. It can be distinguished from other North American species by its gray vestiture; stout, short rostrum which is slightly widened at the antennal insertion and prominently tapered from the antennal insertion to the tip; and the toothed femora.

**Description.** Female: Length 3.0-3.6 mm, 2.0 times longer than wide; integument shining black, appendages and antennae dark reddish brown. Vestiture of bluish or yellowish gray scales.

Rostrum as long or shorter than prothorax, antennal insertion in apical third, slightly wider at antennal insertion than frons between dorsal margin of eyes, from lateral aspect prominently evenly arcuate; pits and rugae distad of antennal insertion deep, especially on dorsum between apices of scrobes. Vestiture proximad of antennal insertion of long, narrow scales, nearly glabrous, distad of antennal insertion. Eye nearly round, gold in color.

Antennae with seven funicular segments; pedicel equal in length to next two segments combined.

Pronotum 1.2 times wider than long, from dorsal aspect nearly parallel sided in basal half, narrower than elytra at base. Scales on dorsum elongate, broader than scales of elytra, usually apically rounded; sides with elongate-oval, white scales.

Elytra 1.1 times longer than wide; nearly parallel sided in basal two thirds, widest just behind humeri, rounded broadly to apices; evenly, broadly rounded in dorsal profile. Scales on interspaces long, narrow, denser on interspaces one, five, and seven. Strial scales narrower than scales on interspaces.

Ventral surface sparsely covered by nonimbricated, oval, plumose margined scales; integument finely visible between scales; no erect setae. Sternum five usually with deep median fovea.

Femora toothed on posterior portion of ventral apical emargination, tooth large and prominent on metafemur, small or very minute on mesofemur and profemur; ventral apical emargination very prominent. Vestiture of long, narrow scales, sometimes with sparse oval scales on proximal portion.

Tibia mucronate, mucrones on protibia larger than on mesotibia and metatibia; scales long, narrow, very fine, hairlike, toward apex of tibia.

Tarsi clothed dorsally with long, narrow scales and fine hairlike setae; claws short, divergent, basal processes parallel or slightly convergent.

Male: length 2.7-3.5 mm; rostrum shorter than prothorax, stout; antennal insertion in apical fourth; pits and rugae on distal portion very deep.

Male genitalia (Fig. 15) with apical portion of median lobe rounded; apical, dorsal, median membranous area elongate-oval, sharply defined posteriorly; median struts narrow, moderately clavate.

Host. Unknown.

Distribution. (Fig. 20).

North Carolina: Black Mts., VI, VII-02, Van Dyke, 52 males, 29 females (CAS), V-15-12, Beutenmuller, 1 male (CAS), Mt. Graybeard, V, VI-26, 9, 19-04, 25, 26 males, 21 females (AMNH), 1 female (Paratype 54993, USNM), V-15-12, W. Beutenmuller, 8 males, 4 females (CAS), VI-02, E. C. Van Dyke, 7 males, 5 females (CAS).

South Carolina: Rocky Bottom, V-22-34, J. A. Beryl, 1 male (USNM).

Total specimens examined: 153

Discussion. Green states that the "type" is a male, but the type specimen examined is definitely female.

## *Tychius lineellus* LeConte

(Figs. 16, 21)

*Tychius lineellus* LeConte, 1876, Proc. Amer. Philos. Soc., 15:217 (Lectotype here designated: male, California, MCZ type 5231); LeConte, 1881, Trans. Amer. Entomol. Soc., 9:xxii; Casey, 1892, Ann. New York Acad. Sci., 6:412-413; Casey, 1910, Can. Entomol., 42:132; Yothers, 1916, Bull. Wash. State Agr. Exp. Sta., 124:7, pl. 1, Fig. 8; Bruhn, 1947, Gr. Basin Natural., 8:3, 18, Fig. 38 a & b (genitalia described); Kissinger, 1963, Ann. Entomol. Soc. Amer., 67(6):771 (proventriculus described).

*Tychius tacitus* Casey, 1910, Can. Entomol., 42:132 (Holotype: female, California "without more definite statement of locality," USNM 36745. Paratypes: 3 males, USNM 36745, T. L. Casey collection).

*Tychius hesperis* Casey, 1910, Can. Entomol., 42:132-133 (Holotype: female, Siskiyou Co., California, USNM 36746, T. L. Casey collection).

*Tychius radians* Casey, 1910, Can. Entomol., 42:133 (Holotype: female, San Diego, California, USNM 36747, T. L. Casey collection).

*Tychius dilectus* Casey, 1910, Can. Entomol., 42:133 (Holotype: female, San Francisco Co., California, USNM 36748. Paratype: 1 male, USNM 36748, T. L. Casey collection).

*Tychius probus* Casey, 1910, Can. Entomol., 42:133-134 (Holotype: female, "near San Francisco," California, USNM 36749).

*Miccotrogus lineellus*: Klima, 1934, *Coleopterorum catalogus*, 29(138):30-31.

The prominent triangular tooth on the middle of the protibia of the male and the projection on the apex of the median lobe of the male genitalia (Fig. 16), readily distinguish this species from its North American relatives. The relatively large size and gray or brownish gray color are also characteristic. This is the only North American *Tychius* known to be associated with *Lupinus*.

Description. Male: length 3.0-4.5 mm, width 1.4-2.1 mm; integument piceous to black, appendages reddish to orangish brown, scales either entirely gray in color or with combination of gray and bronze colored, often metallic scales.

Rostrum shorter than prothorax, antennal insertion in apical third; slightly expanded at antennal insertion, width at antennal insertion equal to or slightly less than width between dorsal margin of eyes; apical third dorsoventrally flattened; in lateral aspect slightly tapered from antennal insertion to extreme tip, slightly expanded before eye; pits and rugae very deep, especially dorsally between antennal insertions where slight depression between elevated lateral carinae is often evident. Vestiture of long, narrow, usually sparse scales, no erect setae, usually



with sparse fine hairlike setae around distal portion of scrobe.

Antennal funicle seven-segmented; pedicel longer than segments two and three combined.

Pronotum as wide or wider than long; sides rounded, 1.6-2.3 times wider at base than at apex. Vestiture on dorsum of long, narrow, apically truncate or acuminate scales; usually with broad median and lateral vittae of slightly wider scales; either all scales gray in color or median and lateral vittae with gray and remaining portion with bronze colored scales; integument usually clearly visible between scales. Lower portion of sides with elongate-oval gray scales.

Elytra in dorsal aspect parallel sided or tapering slightly in basal two thirds, widest at, or just beyond humeri, broadly rounded to apices in distal third; dorsal profile usually prominently convex but sometimes nearly flat in basal third, broadly rounded to apex. Vestiture of long, narrow, apically truncate or acuminate, recumbent scales; scales usually denser and lighter in color on interspace one and alternate interspaces; often alternate interspaces with bronze colored scales. Strial scales narrower than scales on interspaces.

Ventral surface with recumbent, oval, often plumose margined scales; usually with discrete transverse rows of suberect hairlike setae on each sternum. Sternum five without median fovea.

Femora with prominent, apical, ventral emarginations, often with minute tooth on basal portion of emargination of metafemur. Scales long, narrow, gray in color, usually longer and pointed on ventral portions especially on profemur.

Tibiae mucronate, mucro on protibia slightly larger and stouter than meso- and metatibiae; protibia with prominent median, ventral, triangular tooth. Vestiture of fine setae, especially fine apically.

Tarsi clothed with very fine hairlike setae, sparse on segments three and four, tarsal claws long, divergent, basal processes convergent.

Male genitalia (Fig. 16) with apical portion of median lobe constricted, forming narrowed apical process; apical, dorsal, median membranous area sharply defined posteriorly; median struts stout, not strongly clavate.

Female: length 3.6-4.6 mm; rostrum more slender and elongate than in male, pits and rugae distad of antennal insertion shallow; antennal insertion median. Sternum five with deep median fovea. Tibiae with slightly smaller mu-

crones, protibia lacking median, ventral triangular tooth.

**Hosts.** *Lupinus albifrons*, *L. caudatus*, *L. amophilus*, *L. argenteus*, *L. arborus*, *L. bicolor*, *L. chamissionis*, *L. excubitus*, *L. leucophyllus*, and *L. sericeus*. also recorded from Burr Clover and *Gilia*.

#### Distribution. (Fig. 21)

Alberta: Letlibridge, V-30-33, R. M. White, 1 male (CNC).

Arizona: Williams, IV-6, Barber and Schwarz, 1 male (USNM); Fort Valley, Coconino Co., Flagstaff, 7½ mi. N.W., VI-7-64, R. W. Poole, 7350', 1 female (CU).

British Columbia: Osoyoos, V-30-58, H. and A. Howden, 2 females (CNC); Vernon, VI-2, 5, 31-21, 28, R. Hopping, 9 males, 4 females, (CAS), V-16-53, J. E. H. Martin, 1200', 1 female (CNC), Venables, 1 female (USNM).

California: ALAMEDA COUNTY: Koebele, 4 males, 4 females (CAS); 11-30-17, E. R. Leach, 1 female (CAS); Berkeley Hills, N.E. Oakland, IV-8-64, P. Rude, 1400', 1 male (CIS); Oakland, VI-2-46, B. Adelson, 1 male (CIS); Hayward, V-21, 1 male, 1 female (CNC); Hayward, V-21-30, F. E. Blaisdell, 7 males, 13 females (CAS); Oakland, IV-8-06, E. C. Van Dyke, 5 males, 3 females (CAS); Oak Hills, IV-8-06, E. C. Van Dyke, 2 males, 6 females (CAS); BUTTE COUNTY: IV-29-39, F. W. Nunemacher, 3 males (FMNH); Oroville, IV-30-27, H. H. Kelfer, *Lupinus albifrons*, 2 males, 1 female (CAS); Yankee Hill, V-8-28, H. H. Kelfer, 2 females (CAS); CALAVERAS COUNTY: V-15-36, 2 males, 1 female (ISU); Murphys, V-14, 15, 18, 19-36, F. E. Blaisdell, Alt. 2500', 15 males, 28 females (CAS), 1 male (PANS); Mokel Hill, V, F. E. Blaisdell, 1 male (CAS); CONTRA COSTA COUNTY: Koebele, 1 male (CAS); Antioch, III-29-56, B. J. Adelson, 1 male, 1 female (CIS), V-22-48, E. Ehrenford, 1 male (CIS), III-31-33, G. A. Marsh, 2 males, 3 females (CIS), IV-5-56, J. Powell, 1 male (CIS), IV-9-49, L. W. Quate, 1 male, 1 female (CIS), II-26-39, J. G. Shenafelt, 1 male (LA); Berkeley, V-33, E. S. Ross, 1 male (CAS); Orinda, V-4-34, 1 male, 7 females (LA); EL DORADO COUNTY: F. W. Nunemacher, 1 male (BYU); Placerville, V-20-13, 1 male (ISU); 3 males (CIS), F. H. Wymore, 1 male (CAS); FRESNO COUNTY: Coolinga, IV-8-51, E. C. Lindsay, 3 males, 3 females (CIS); HUMBOLDT COUNTY: V-2, 3, 7-11, F. W. Nunemacher, 14 males, 12 females (FMNH); Fieldbrook, V-29-03, H. S. Barber, *Lupinus*, 4 males, 6 females (USNM); Korb, VI-16-16, F. E. Blaisdell, 1 male, 4 females (CAS); INYO COUNTY: Argus Mts., IV-91, Koebele, 1 female (CAS); Independence, 2 males (CAS); IV-19-19, Blaisdell, 2 males, 2 females (CAS), VI, A. Fenyes, 1 male (CAS), IV, V-27, 19, 2-18, 19, L. L. Muchmore, 12 males, 7 females (LA); Lone Pine, V-26-37, 2 males (LA); KERN COUNTY: Glennville, V-7-31, A. T. McClay, 5 males, 6 females (CIS), 3 males, 2 females (CAS); Indian Wells, IV-19-62, E. Lehre, 1 male (CIS), IV-18-62, C. A. Toschi, 3 males, 4 females (CIS); Isabella, IV-4-34, R. P. Allen, 1 female (CAS), R. Hopping, 1 female (CAS); Woody, 1 mi. E., V-3-64, J. Powell, 1 male (CIS); LASSEN COUNTY: Doyle, V-20-31, E. O. Essig, 7 males, 8 females (CIS); LOS ANGELES COUNTY: IV, 10 males, 13 females (USNM); III-22-39, K. E. Stager, 1

- male (LA); IV-2-10, 1 male (LA); Antelope Valley, III-30-35, 1 male (CAS); Azusa, IV-2 males, 2 females (CAS); Dr. A. Feynes, 2 males, 2 females (CU); Cole, VII, 1 female (CAS); Durate, Wickham, 1 male, 1 female (USNM); Fairmont, IV-15-28, 1 female (CNC); El Segundo, IV-27-38, D. Poole, *Lupinus chamissonis*, 1 female (LA); Lancaster, V, 1 male (CAS); Neenach, V-17-28, J. O. Martin, 5 males, 3 females (CAS); Pasadena, IV, 1 female (CAS); Pasadena, C. Schaeffer, 2 males, 2 females (BYU); Pomona, 1 female (INHS), 1 male, 1 female (LA), 3 males, 2 females (MCZ); MADERA COUNTY: Coarsegold, V-26-42, C. Kennett, *Lupinus*, 3 males, 1 female (CIS); MARINA COUNTY: Fairfax, V-9-20, E. P. Van Duzee, 11 males, 8 females (CAS); Mill Valley, IV-20-21, F. E. Blaisdell, 3 males, 4 females (CAS), 1 male, 1 female (CU), IV-21-24, E. P. Van Duzee, 3 males, 2 females (CAS); Olema, V-25-52, O. Bryant, 1 male (BYU); MARIPOSA COUNTY: El Portal, V-18-38, C. T. Sierra, 2 females (LA), J. R. Warren, 2 females (LA); Coulterville, IV-17-55, J. R. Jessen, 1 male (CIS); Mariposa, V-17-59, C. H. Toschi, 1 female (CIS); Yosemite, V-24-38, J. R. Warren, 3880-4000', 1 female (LA); MODOC COUNTY: Goose Lake, VII-21-22, C. L. Fox, 1 male, 1 female (CAS); Lassen Creek, VII-22-22, F. E. Blaisdell, 1 male (CAS); MONO COUNTY: VI-4-17, F. E. Blaisdell, 1 male (CAS); MONTEREY COUNTY: Arroyo Seco Camp, V-5-56, 1 female (USU); Bryson, IV, V-19, 20, 26-17, 20, E. P. Van Duzee, 9 males, 11 females (CAS); Carmel, IV-2-11, E. C. Van Dyke, 4 males, 1 female (CAS), IV, V-2, 25, 11, 8-29, 23, L. S. Slevin, 1 male, 2 females (CAS); Monterey, IV-12-54, R. P. Allen, 2 females (CIS), VI, A. Feynes, 1 male (CAS), 3 males (CU), 2 males, 1 female (CNC); Pacific Grove, VI, A. Feynes, 1 female (CAS), VII-16, 18-1898, *Lupinus arboris*, 1 male, 1 female (USNM); Pine Canyon, III-19-20, L. S. Slevin, 1 male (CAS); Tassajara, V-26-20, L. S. Slevin, *Lupinus*, 2 males, 4 females (CAS); Carmel, Tulareitos Ranch, IV-27-54, 1 male (CIS); NAPA COUNTY: E. C. Van Dyke, 1 female (CAS); ORANGE COUNTY: E. C. Van Dyke, 1 male (CAS); PLUMAS COUNTY: 3 mi. S. Frenchman Res. 6000', W. Cagne and C. W. O'Brien, *Lupinus caudatus*, 12 males, 7 females (CWO); RIVERSIDE COUNTY: Aguanga, V-12-29, 1 male (CNC); Beeming, IV-13-1898, L. O. Howard, 2300' (USNM); Ribbon Wood, San Jacinto Mts., V-30-39, E. C. Lindsay, 1 male (CIS); SACRAMENTO COUNTY: Fair Oaks, V-11-13, Smith and Vosler, 7 males, 1 female (LA), 1 male (CAS); SAN LUIS OBISPO COUNTY: Guyama Valley, VI-21-31, E. P. Van Duzee, 1 female (CAS); Pozo, IV-30-62, C. A. Toschi, 1 male (CIS); Simmler, III-20-40, J. W. Tilden and G. S. Mansfield, 1 female (CAS); SAN BERNARDINO COUNTY: Coquillett, 1 male (USNM); Cajon, V-14-52, O. Bryant, 7 males, 8 females (BYU); Ontario, III-7-40, Hopper and Graves, Burr Clover, 16 males, 19 females (USNM); SAN DIEGO COUNTY: 2 males, 1 female (CIS); III-12-14, E. P. Van Duzee, 1 female (CIS); Alvarado Co., IV-21-51, J. Powell, 1 male (CIS); Jacumba, X-26-26, Van Dyke, 1 male (CAS); Mount Palomar, VI-28-63, H. L. Griffin, 1 male, 2 females (CIS); Poway, F. E. Blaisdell, 1 male, 2 females (CAS); San Diego, 2 males (CU), F. E. Blaisdell, 1 female (CIS), E. C. Van Dyke, 1 male (CAS); Wickham, 1 male, 1 female (MCZ); SAN FRANCISCO COUNTY: Coquillett, 1 female (USNM); Van Dyke, 2 males, 1 female (CAS); San Francisco, 1880, F. E. Blaisdell, 1 male, 6 females (CAS); Van Dyke, 1 male (CAS); SAN JOAQUIN COUNTY: Ripon, III-25-51, M. Crazier, 1 male (AMNH); Ripon, III-23-31, C. H. Schwab, 1 female (LA); Stockton, III-19-34, M. Crazier, 1 male (LA); Tracy, V-4-33, A. E. Michlbracher, 1 male (CIS); SANTA CLARA COUNTY: Mt. Hamilton, IV-15-47, G. E. Boshart, *Githa*, 8 males, 2 females (CIS); San Antonio Valley, IV-8-47, R. F. Smith, *Lupinus*, 1 male (CIS); SANTA CRUZ COUNTY: Ben Lomond, V-17-31, E. C. Van Dyke, 1 male (CAS), VI-1-30, L. Saylor, 1 female (USNM); Santa Cruz Mts., VI-11-22, 1 male (CIS); VI-20-12, Coleman, 1 male, 3 females (CIS); SIERRA COUNTY: Gold Lake, VII-16-21, 1 female (CAS); SISKIYOU COUNTY: VII, 2 females, (USNM); SOLANO COUNTY: Rio Vista, V-19-49, E. G. Lindsay, *Lupinus*, 7 males (CIS); SONOMA COUNTY: Mark West Spgs., V-10, 11-30, E. P. Van Duzee, 8 males, 3 females (CAS); IV-27-30, J. O. Martin, 2 males, 2 females (CAS); Mt. St. Helena, IV-17-32, C. E. Morland, 1 female (LA); V-6-30, E. C. Van Dyke, 3 males (CAS); Sobre Vista, IV-24-10, E. C. Van Dyke, 1 female (CAS); TRINITY COUNTY: Carville, V-28-34, 2400-2500', 1 male (FMNH); TULARE COUNTY: Fairview, 9 mi. So., V-1-64, J. Doyen, 4 males, 5 females (CIS), IV-29-64, P. Rude, *Lupinus excubitus*, 4 males, 1 female (CIS); Greenhorn Mts., V-7-31, E. C. Van Dyke, 3 males, 3 females (CAS); White River, V-17-30, E. C. Van Dyke, 5 males, 3 females (CAS); TUOLUMNE COUNTY: North Fork Tuolumne River, 3 mi. N.E. Tuolumne, V-1-61, R. M. Brown, 2 males, 6 females (CAS); Strawberry, VIII-4-60, G. W. Colliver, 1 male (CIS); YOLO COUNTY: Rumsey, V-3-36, B. E. White, 2 males, 2 females (CAS); SANTA ROSA and SANTA CRUZ ISLANDS: Santa Cruz Is., IV-8-41, G. P. Kamakoff, *Lupinus bicolor*, 4 males, 7 females (LA).
- Colorado: 1 male, (USNM); Palm, 1 female (AMNH); Boulder, VI-10-61, B. H. Poole, 5500', 1 male (CNC); Denver, VII-7, Hubbard and Schwarz, 1 male (USNM); Denver, VII-7, F. C. Bowditch, 1 male (MCZ); Denver, Adams Sp., VI-15-49, B. L. and J. G. Rozen, 1 female (CIS); Glenwood Springs, VII, VIII, A. Feynes, 2 males, 2 females (CAS); Pueblo, V-20, H. Soltau, 1 female (USNM); Steamboat Springs, VII-42, VIII-45, 21 males, 28 females (BYU); Valmont Butte, Boulder, VI-20, VII-61, J. R. Stainer, 5300', 1 female (CNC).
- Idaho: Caribou Co., Soda Springs, 1 mi. N., VII-9, 10-68, D. R. Harris, *Lupinus*, 2 males (WEC); Coeur D'Alene, VI, Wickham, 1 female (USNM); Winchester, V-11-24, M. C. Lane, 1 female (USNM).
- Montana: Boulder, Jefferson Co., VII-31-68, W. E. Clark, *Lupinus sericeus*, 5 males, 2 females (WEC); Bozeman, VII-25-03, 4800', 1 male (USNM); Bridger Canyon, VII-12-02, 5000', 1 female (USNM); Big Horn Co., Bushby, 4 mi. W., VI-8-69, W. E. Clark, *Lupinus*, 2 males (WEC); Florence, V-24-13, H. P. Wood, 2 males (USNM), VI-1, 17-12, 1 male, 2 females (USNM); Custer Co., Miles City, 17 mi. N.E., VI-8-69, W. E. Clark, 1 male (WEC); Missoula, VII-6-68, 1 female (USNM); Silver Bow Co., Nissler, 5 mi. N., VIII-6-68, W. E. Clark, *Lupinus sericeus*, 1 male (WEC); Ravalli Co., Roaring Lion Canyon, VI-23-35, W. L. Jellison, *Lupinus*, 9 males, 7 females (USNM); Big Horn Co., Wyo., 11 mi. S., VI-8-69, W. E. Clark, *Lupinus*, 1 male, 2 females (WEC).
- Nevada: Horn, 1 male (PANS); Carson City, VI-25, 26-29, R. R. Usinger, 9 males, 10 females (CAS); Wickham, 1 female (USNM); Ormsby Co., VII, Baker, 2 males (FMNH), 1 male (USNM).
- Oregon: Athena, VI-12-38, K. Gray and J. Schuh, 1 male (USNM); Corvallis, VI-7-32, E. C. Van Dyke, 1 female (CAS), V-22-35, K. Gray, 1 female (CAS);

Elgin, VI-20-22, A. L. Lovett, 1 female (CAS); Hood River, VI-4-17, F. R. Cole, 1 male (USNM); Kamela, VI-10-25, M. C. Lane, 1 male (USNM); No Powder, VI-8-24, 1 male (USNM); Steen Mts., 4 mi. W. Fish Lake, VII-15-53, Roth and Beer, 1 male, 1 female (OSU); Woods, VI-13-39, K. M. and L. M. Fender, 1 female (FMNH).

Saskatchewan: Farewell Creek, 1 male, 2 females (BYU).

Utah: Avon, V-29-39, G. F. Knowlton, 1 female (USNM); Beaver Co., VI-14-57, G. F. Knowlton, 2 males, 2 females (OSC); Bellevue, Schaeffer, 1 female (BYU); Blue Springs Hills, Box Elder Co., VI-28, V. M. Tanner, 1 male (BYU); Cache Jct., VI-11-03, 1 female (BYU); Cove Fort, V-29-37, G. F. Knowlton, 1 male (USNM); Dixie Nat'l. Forest, VI-15, 35, G. F. Knowlton, *Lupinus*, 2 females (USU); Eden, VII-23-37, 1 female (USU), Enterprise, 8 mi. S., VI-15-35, G. F. Knowlton, *Lupinus*, 2 females (USU); Utah Co., Hobbble Creek Canyon, Springville, 5 mi. E., V, VI, VII, VIII-3, 24, 17, 11, 16-68, 69, W. E. Clark, *Lupinus leucophyllus*, 33 males, 30 females (WEC), 19 mi. E., VI-6-68, *Lupinus sericeus*, 14 males, 22 females (WEC); Huntsville, V. M. Tanner, 1 male (BYU); Leeds, IV-25-35, G. F. Knowlton and C. F. Smith, *Lupinus*, 2 males, 2 females (USNM); Logan, VI-10-50, John V. Bruce, 1 male (USU); Mantau, VI-20-61, G. F. Knowlton, 1 male (USU); Mt. Meadows, VI-15-35, G. F. Knowlton, 1 male (USU); Iron Co., Orton, 12 mi. N.W., VII-17-67, H. R. Burke, 1 female (TAM); Salt Lake City, Big Cottonwood Canyon, V-22-33, G. F. Knowlton, *Lupinus*, 1 male, 4 females (USU), 2 females (USNM), VI-6-35, 1 male (USU); St. George, V-28-35, E. C. Van Dyke, 1 male (CAS); Duchesne Co., Mtn. Home, 7 mi. N., VII-13-68, W. E. Clark, *Lupinus sericeus*, 11 males, 11 females (WEC); Trout Creek, V-8-34, T. O. Thatcher, *Lupinus*, 1 male (USU); Wasatch, VI-27, Hubbard and Schwarz, 8 males, 8 females (USNM), VI-27, Horn, 2 males (PANS).

Washington: Blewett, V-29-32, J. Wilcox, 1 female (OSU); Brewster, IV-29-12, 1 female (USNM); Dryden, V-16-42, E. C. Johnston, 1 female; Kooskooski, V-1-46, G. Nelson, 1 female (TAM); Walla Walla, VI-9-38, E. C. Van Dyke, 1 male, 1 female (CAS); Sanpoil, Keller, VII-3-21, M. C. Lane, 1 female (USNM); Wawawai, 1 male (USNM).

Wyoming: Johnson Co., Buffalo, 8 mi. S.W., VI-20-68, W. E. Clark, *Lupinus ammophilus*, 8 males, 5 females (WEC), 5 mi. W. *Lupinus argenteus*, 1 male, 1 female (WEC), VI-7-69, 3 males, 1 female (WEC); Campbell Co., Gillette, 22 mi. W., W. E. Clark, *Lupinus argenteus*, 8 males, 2 females (WEC); Niobrara Co., Lusk, 11 mi. S., VI-15-68, W. E. Clark, *Lupinus argenteus*, 3 male, 1 female (WEC); Teton Co., 12 mi. S. Jackson, VI-23-62, 6000', 1 male, 1 female, C. W. O'Brien (CWO).

Total specimens examined: 1011.

**Discussion.** Variation is evident in the size, shape, and color of the scales. Specimens from California exhibit a wide range of variation and some distinct varieties can be associated with particular geographic areas. Some specimens from the Los Angeles area have gray and bronze-colored scales which are unusually long and acuminate. The lectotype locality is probably Los Angeles, as the lectotype has this type of vesti-

ture. Specimens from the west slope of the Sierra Nevada Mountains are relatively small and have gray and metallic bronze areas on the prothorax and on alternate elytral interspaces. Specimens from the east slope have no bronze-colored scales. The scales on these are also denser and broader. Two populations were sampled from Hobbble Creek Canyon in Utah County, Utah. Specimens from the mouth of the canyon taken on *Lupinus leucophyllus* exhibit contrast between gray and bronze scales, but specimens taken a few miles up the canyon from *L. sericeus* are nearly unicolorous, as are specimens from the same host at Mountain Home, Duchesne County, Utah.

### *Tychius liljebjadi* Blatchley

(Figs. 13, 19)

*Tychius liljebjadi* Blatchley, 1916, In: Blatchley and Leng, Rhynchophora or weevils of northeastern America, p. 246-247 (Holotype: male, Steuben Co., Indiana; Purdue).

*Tychius arator*: LeConte, 1876, Proc. Amer. Philos. Soc., 15:216; Casey, 1892, Ann. New York Acad. Sci. 6:415; Blatchley and Leng, 1916, Rhynchophora or weevils of northeastern America, p. 247; Marcovitch, 1916, Rep. State Entomol. Minn., 16:140.

*Miccotrogus liljebjadi*: Klima, 1934, *Coleopterorum Catalogus*, 29(138):30.

This species resembles *T. tectus* LeConte, in general facies. It can be distinguished from other North American species by the shape of the rostrum which is prominently swollen basally, and smooth, shining, and finely acuminate beyond the antennal insertion; by the light yellowish brown scales; and by the sparse, scattered, round, white scales on the elytra.

**Description.** Male: Length 2.8-3.4 mm, width 1.5-1.7 mm; integument black on pronotum, usually dark reddish brown on elytral apices, appendages light to dark reddish brown. Vestiture of light yellowish brown scales on dorsum, scales on ventral surface white.

Rostrum shorter than prothorax; from lateral aspect swollen basally, prominently arcuate from dorsal margin of eyes to basal fourth, then slightly to moderately arcuate to apex; antennal insertion in apical third; moderately to strongly acuminate, smooth, shining, glabrous, with shallow punctures distad of antennal insertion. From dorsal aspect not strongly tapered from base to apex, slightly expanded at antennal insertion, scales of uniform color, size and shape, long, narrow or wedge shaped; no erect or suberect setae.

Antennal funicle seven-segmented, pedicel shorter than next three segments combined.

Pronotum 1.2 times wider than long; sides prominently arcuate, slightly constricted at anterior margin, nearly twice as wide at base as at anterior constriction. Dorsum covered mainly by broad, usually apically rounded scales. Sides and often small median basal portion of dorsum with round to elongate, white scales.

Elytra moderately convex in dorsal profile; in dorsal aspect widest just beyond middle, prominently rounded in apical third. Scales on interspaces of uniform size, shape and color; long, narrow, often spatulate; sparse, scattered, white scales mainly on apical third, denser on sides. Strial scales narrower than scales on interspaces.

Ventral surface with pale yellow to white, round to elongate-oval recumbent scales; erect or suberect setae absent. Sternum five with deep median fovea.

Femur with prominent, apical, ventral emargination, usually with minute tooth on proximal portion of emargination. Vestiture of uniform size and shape, similar to that of elytra but lighter in color.

Tibia mucronate, mucro on protibia usually larger than mucrones on mesotibia and metatibia; vestiture of long, narrow, scales and fine setae, setae predominant apically and ventrally.

Tarsi clothed with fine, elongate, white to yellow scales; claws short, stout; tooth connate in basal fourth, not as long as claw.

Male genitalia (Fig. 13) with apical portion of median lobe broadly rounded; apical, dorsal, median membranous area small, oval, strongly defined posteriorly; median lobe constricted medially; median struts clavate.

Female: similar to male but with rostrum longer and more finely acuminate beyond antennal insertion.

Host. *Astragalus canadensis*.

Distribution. (Fig. 19).

Alberta: Cypress Hills, VI-30, F. S. Carr, 1 male, 1 female (UA), 1 male (CNC); Medicine Hat, VI-6, 28-26, 28, F. S. Carr, 3 males, 1 female (CAS), 1 female (UK); 1 male (UA), VI-28-26, 2 males (USNM), 1 male, 1 female (CNC), 1 male, 3 females (BYU).

Colorado: Denver, VII-7, Hubbard and Schwarz, 1 female (USNM).

Illinois: H. Soltan, 1 female (USNM).

Iowa: Ames, VII-26-51, J. Laffoon, *Astragalus canadensis*, 2 males, 2 females (ISU), VI-3-32, J. A. Adams, 1 male (ISU), IV, VIII-30, 25-1897, 2 males, 1 female (ISU); VII-7-34, H. E. Jacques, 1 male, 2 females (ISU), Iowa Co., VII-30-35, H. E. Jacques, 1 female (ISU), VII-5-35, G. Warren, 1 female (USNM); Granite VII-28-16, D. Stoner, 1 male (USNM); Lake Okoboji VII, VIII-6, 13, 22-16, 17, L. L. Buchanan, D. Stoner, 11 males, 11 females (USNM); Ledyard, 2 mi.

S., V-9-26, G. O. Hendrickson, 1 female (ISU); Lemars, 6 mi. N.W., VII-26-28, G. O. Hendrickson, 1 male, 1 female, (USNM), 2 females (ISU).

Kansas: 1 male (USNM); Douglas Co., F. H. Snow, 900', 1 female (UK); Topeka, VI, VIII-12, Popenoe, 3 males, 4 females (USNM); Leavenworth Co., 6 mi. W. Linwood, VI-17-64, J. B. Karen, 1 female (CWO); Wallace Co., F. H. Snow, 300', 1 male (UK).

Manitoba: Aweme, IV, VIII-19, 12-30, R. M. White, *Astragalus canadensis*, 1 male, 2 females (CNC).

Michigan: Grand Ledge, VII-16, Hubbard and Schwarz, 2 males (USNM); Monroe, Hubbard and Schwarz, 1 male, 1 female (USNM).

Minnesota: Chisago Co., Chisago Lake, VII-19-21, F. P. Metclaf, in seed of *Astragalus canadensis*, 1 female (USNM); St. Anthony Park, *Astragalus canadensis*, 2 males (USNM).

Missouri: C. Schaeffer, 2 males, 1 female (BYU).

Nebraska: Seward, 1 male, 1 female (BYU).

North Dakota: Case Co., VII-15-63, R. Gordon, 1 male (BYU); Fargo, VII-22-22, R. L. Webster, 1 female (BYU); Wahpeton, 1933, Wickham, 1 male, 1 female (USNM).

South Dakota: 2 males (CU); Volga, 1 male, 2 females (LA); Truman (Wickham Coll.), 1 female (USNM); Roberts Co., 21 mi. S. Sisseton, VII-1-64, L. and C. W. O'Brien, 3 males (CWO).

Texas: Dallas, F. C. Bowditch, 1 female (MCZ).

Washington: Metaline Falls, VII-20-32, T. Terrell, 1 female (USNM).

Total specimens examined: 101.

**Discussion.** The type specimen of this species was examined and determined to be conspecific with specimens identified as *T. arator* Gyllenhal in collections in North America. Specimens labeled *T. arator* Gyllenhal have been examined from the LeConte, Casey and Blatchley collections and found to be *T. liljebladi*. The basal swelling and acuminate apical portion of the rostrum are not well developed in the holotype. *Tychius arator* Gyllenhal is a synonym of *T. aratus* Say.

### *Tychius tectus* LeConte

(Figs. 1, 12, 19)

*Tychius tectus* LeConte, 1876, Proc. Amer. Philos. Soc., 15:217 (Holotype: female, Kansas, MCZ type 5233); LeConte, 1879, Bull. U.S. Geol. and Geog. Survey., 5:506; Casey, 1892, Ann. New York Acad. Sci., 6:414-415; Casey, 1910, Can. Entomol., 42:135.

*Tychius languidus* Casey, 1910, Can. Entomol., 42:135 (Holotype: male, Garland, Colo., USNM 36753, T. L. Casey collection).

*Miccotrogus tectus*: Klima, 1934, *Coleopterorum Catalogus*, 29(138):32.

This species differs from other members of the *T. sordidus* species group by the yellow or reddish brown rather than gray vestiture. The body is oblong (Fig. 1); the sides of the elytra nearly parallel, elytra with basal portion flat

rather than rounded in dorsal profile. It can be distinguished from *T. liljebladi*, which it resembles in general facies by the shape of the rostrum, which is not tumidus at the base nor acuminate in the apical portion, and by the deeply rugulose distal portion.

**Description.** Male: length 2.5-3.8 mm; integument piceous to black, appendages light to dark reddish brown. Vestiture of yellowish or reddish brown scales, usually with median and lateral vittae of white scales.

Rostrum shorter than prothorax; in lateral aspect usually moderately to prominently and evenly arcuate, but often nearly straight proximad of antennal insertion; antennal insertion in apical third; in dorsal aspect moderately, evenly tapered from base to apex; apex narrower than frons between dorsal margin of eyes, distal portion oval in cross section, deeply rugulose. Vestiture of elongate-oval or parallel sided scales with rounded or truncate apices, scales on sides usually of lighter color; glabrous distad of antennal insertion except for sparse setae around apical portion of scrobe.

Antennal funicle seven-segmented, pedicel usually as long or longer than next three segments combined; scales on antennae elongate, clavate.

Protonum wider than long, usually widest in front of middle, rounded slightly to base and strongly to apical constriction (Fig. 1); 1.4-1.7 times wider at base than at apical constriction. Vestiture of elongate-oval or parallel sided, apically rounded or truncate, light to dark yellowish or occasionally reddish brown, strigose scales, usually with median vittae and lateral, patches of white scales. Lower portion of sides with elongate-oval, nonstrigose, usually white or light colored scales, some of which may extend to dorsum, especially basally.

Elytra in dorsal aspect with sides converging slightly or parallel in basal two-thirds; prominently tapered to apices, usually widest just distad of humeri; nearly flat or very slightly rounded in basal half in dorsal profile, declivity broadly rounded. Interspaces with scales similar to those on prothorax. Interspace one with dense, oval, white, nonstrigose scales from base to apex, and with several long, narrow, darker colored scales intermingled throughout; usually with broad lateral vittae of white, oval scales. Scales of striae punctures elongate, narrower than scales on interspaces.

Ventral surface densely covered by white or nearly white, broadly imbricated, oval to elongate-oval scales; no distinct rows of erect or

suberect setae. Sternum five with median fovea, usually concealed by scales.

Femur with prominent, apical, ventral emargination; no minute tooth on proximal portion of emargination. Vestiture of dense, broad, elongate, usually parallel sided, truncate, or apically rounded scales, with elongate-oval, nonstrigose scales on basal portion.

Tibiae mucronate, mucro on protibia largest, about equal in length to tarsal claw. Vestiture of elongate, broad, strigose scales with very fine hairlike setae near apex.

Tarsi clothed dorsally with hairlike setae and broad, strigose scales; claws with basal processes parallel, nearly half as long as claw.

Male genitalia (Fig. 12) with apical portion of median lobe rounded; apical, dorsal, median membranous area round, extending proximad beyond middle of median lobe, strongly defined posteriorly; median struts and tegminal strut strongly clavate.

Female: rostrum slightly longer and narrower, antennal insertion near middle; mucrones slightly smaller.

**Hosts.** *Astragalus adsurgens* var. *robustior*, *A. bisulcatus* var. *heydenianus*, *A. scopulorum*, *A. tenellus*, *Oxytropis besseyi*, *O. campestris* var. *gracilis*, *O. lambertii* and *O. sericea*, *Hedysarum* sp. Also recorded from "vetch."

#### Distribution. (Fig. 19).

Alaska: Big Delta, VII-16-48, R. T. Sailer, 3 males, 1 female (USNM).

Alberta: Cardston, 9 mi. S., VIII-6-68, W. E. Clark, *Oxytropis campestris* var. *gracilis*, 4 males, 4 females (WEC); Edmonton, VII-14-20, F. S. Carr, 1 female (AMNH), VII-14-20, 1 male, 3 females (CAS), 2 males, 2 females (CU), 2 males, 1 female (MCZ), 3 males (PANS), 1 female (PA), 5 males, 5 females (UA), 3 males, 2 females (UK), 11 males, 5 females (USNM), 4 males, 1 female (OSU), VII-14-20, J. G. Shenafelt, 1 female (LA); Medicine Hat, VII-14-20, A. C. Davis coll., 1 male, 1 female (CNC).

British Columbia: Naramata, V-28-58, H. and A. Howden, "on vetch," 1 male, (CNC); Oliver, 2 mi. W., V-29-58, H. and A. Howden, "on vetch," 1 male, 1 female (CNC); Penticton, 3 mi. E., VI-1-58, H. and A. Howden, "on vetch," 2 males (CNC); Ritcher Pass Road, 7 mi. W. Osoyoos, VI-2-58, H. and A. Howden, 2 males, 1 female (CNC).

Colorado: Buena Vista, VI, VII-15, 30, 1, 6-96, H. F. Wickham, 7900-8000', 5 males, 2 females (MCZ), VII-I, 6-1896, 5 males, 2 females (USNM), VIII-5, Liebeck Coll., 3 males, 1 female (MCZ), III-7, Hubbard and Schwarz Coll., 4 males, 3 females (USNM), H. F. Wickham, 4 males, 1 female (USNM), 6 males, 3 females, (AMNH), 4 males (CU), 1 male (CAS), 1 male, 1 female (UK), Boulder, VI-9-61, W. R. M. Mason, 5500', 1 male (CNC); Colorado Springs, II-10; 2-4, H. Soltan Coll., 3 males, 10 females (USNM); Garland, 24 males, 14 females (USNM), 2 males (UK), VI-30, F. C. Bowditch, 1 male (MCZ), VI-29, 30, Horn Coll., 2

females (PANS) VI-29, 30, Hubbard and Schwarz, 6 males, 5 females (USNM); Mancos, La Plata Co., 7 mi. E., V-30-69, W. E. Clark, *Astragalus bisulcatus* var. *heydenianus*, 3 males, 2 females (WEC); Montrose, VIII-8-1885, F. C. Bowditch Coll., 6000', 2 males, 1 female (MCZ); Archuleta County, Pagosa Springs, 26 mi. S.E., V-31-69, W. E. Clark, *Astragalus bisulcatus* var. *heydenianus*, 15 males, 8 females (WEC); Poudre Canyon, Larimer Co., VI-12-68, W. E. Clark, *Oxytropis lambertii* and *O. sericea*, 57 males, 33 females (WEC); Ridgeway, Ouray Co., 2 mi. S.W., V-31-69, W. E. Clark, *Astragalus bisulcatus* var. *heydenianus*, 5 males, 5 females (WEC); Toponas, Routt Co., 3 mi. E. VI-4-69, W. E. Clark, *Astragalus tenellus*, 9 males, 5 females (WEC); 19 mi. E., VI-5-69, W. E. Clark, *Astragalus scorpulorum*, 7 males, 3 females (WEC).

Manitoba: Aweme, VII-4-03, N. Criddle, 1 male (CNC); VI-4-29, R. M. White, *Oxytropis lambertii*, 2 males, 1 female (CNC); Treebank, 5-18-27, N. Criddle, *Astragalus*, 1 male (CNC); VI-14-27, R. M. White, 2 males, 2 females (CNC).

Montana: Powder River Co., Ashland, 7 mi. E., VI-8-69, W. E. Clark, *Oxytropis*, 3 males, 1 female (WEC); Big Horn Co., Bushby, 4 mi. W., VI-8-69, W. E. Clark, *Oxytropis sericea*, 25 males, 16 females (WEC); Kalispell, VI-13-20, Wickham, 1 male (USNM); Custer Co., Miles City, 17 mi. N.E., VI-8-69, W. E. Clark, *Oxytropis lambertii*, 3 males, 2 females (WEC); Missoula, Liebeck Coll., 5 males, 3 females (USNM); Silver Bow Co., Nissler, 5 mi. N., VIII-6-68, W. E. Clark, *Astragalus adsurgens* ssp. *robustior*, 1 male, 2 females (WEC); Glacier Co., Piegan, 1 mi. S., VIII-6-68, W. E. Clark, *Oxytropis campestris* var. *gracilis*, 1 male, 2 females (WEC); 1 mi. S., 1 female (WEC).

Nebraska: McCook, Hubbard and Schwarz, 1 female (USNM); F. C. Bowditch Coll., 1 male (MCZ); Wickham Coll., 2 males, (USNM); R. Hopping Coll., 1 male, 1 female (CAS); War Bonnet Canyon, 1 male (USNM).

Nevada: Elko Co., east slope Spruce Mtn., VI-26-56, W. C. Russell, 1 male (CIS).

New Mexico: Rio Arriba Co., Chama, 17 mi. N.W., V-31-69, W. E. Clark, *Astragalus bisulcatus* var. *heydenianus*, 12 males, 8 females (WEC); Jemez Mts., VI, VIII, IX-21, 8-21-27, J. Woodgate, 4 males, 5 females (CAS).

North Dakota: Golden Valley Co., Beach, 12 mi. E., VI-9-69, W. E. Clark, *Oxytropis lambertii*, 1 male, 2 females (WEC); Dunn Co., Killdeer, 1 mi. S., VI-10-69, W. E. Clark, *Oxytropis lambertii*, 1 male (WEC); McKenzie Co., Newtown, 17 mi. W., VI-10-69, W. E. Clark, *Astragalus tenellus*, 10 males, 10 females (WEC); Mountrail Co., Parshall, 3 mi. N.W., VI-10-69, W. E. Clark, *Oxytropis*, 10 males, 10 females (WEC); Theodore Roosevelt National Park, South Unit, VI-9, 10-69, W. E. Clark, *Oxytropis sericea*, 19 males, 4 females (WEC); Williams Co., Williston, 33 mi. N., VI-11-69, W. E. Clark, *Oxytropis*, 2 males (WEC); 31 mi. N., VI-11-69, W. E. Clark, *Oxytropis*, 1 male, 1 female (WEC).

Oregon: Kamela, VI-10-25, M. G. Lane, 2 males, 3 females (USNM).

Saskatchewan: Fish Creek, VII-18-25, K. M. King, 1 male (CNC); Fort à LaCombe, VII-17-25, K. M. King, 1 female (CNC); Moose Jaw, 16 mi. E., VI-12-69, W. F. Clark, 1 male, 2 females (WEC).

South Dakota: Lawrence Co., Brownsville, 1 mi. S., VI-18-68, W. E. Clark, *O. campestris* var. *gracilis*, 14 males, 7 females (WEC); Lawrence Co., Cheyenne

Crossing, 2 mi. E., VI-18-68, W. E. Clark, *O. campestris* var. *gracilis*, 5 males, 3 females (WEC); Todd Co., Mission, 15 mi. S., VI-11-50, Hicks, Slater, Laffoon, 1 male, 2 females (ISU); Pennington Co., Pactola Reservoir, VI-17-68, W. E. Clark, 1 female (WEC).

Wyoming: Horn Coll., 1 male (PANS); Albany Co., Albany, 5 mi. N.E., VI-5-69, W. E. Clark, *Oxytropis sericea*, 3 males (WEC); Johnson Co., Buffalo, 5 mi. W., VI-7, 14-69, W. E. Clark, *Astragalus adsurgens* ssp. *robustior*, 15 males, 4 females (WEC); 8 mi. S.W., VI-20-69, W. E. Clark, *Oxytropis sericea*, 19 males, 10 females (WEC); Campbell Co., Gillette, 22 mi. W., VI-20-68, W. E. Clark, *Oxytropis lambertii*, 1 male, 1 female (WEC); Johnson Co., Kaycee, 1 mi. N., VI-7-69, W. E. Clark, *Oxytropis besseyi*, 5 males, 2 females (WEC); Fremont Co., Lander, 14 mi. S., VI-14-69, W. E. Clark, 1 female (WEC); Albany Co., Laramie, 4 mi. N.W., VI-6-69, W. E. Clark, *Oxytropis lambertii*, 5 males, 3 females (WEC); Niobrara Co., Lusk, 11 mi. S., VI-15-68, W. E. Clark, *Oxytropis besseyi*, 4 males, 1 female (WEC); Carbon Co., Medicine Bow, 3 mi. N., VI-6-69, W. E. Clark, *Oxytropis sericea*, 5 males, 4 females (WEC); Shoshoni, Fremont Co., 11 mi. N., VI-21-68, W. E. Clark, *Oxytropis lagopus*, 14 males, 11 females (WEC); Hot Springs Co., Thermopillis, 10 mi. N., VI-21-68, W. E. Clark, *Oxytropis lagopus*, 7 males, 5 females (WEC); Washakie Co., Worland, 7 mi. E., VI-14-69, W. E. Clark, *Oxytropis lagopus*, 6 males, 6 females (WEC).

Yukon Territory: Ross River, 132°3', 61°56', 3,000 ft., VI-20-60, *Hedysarum*, J. E. H. Martin, 22 males, 23 females (CNC); VI-19-60, E. W. Rockburne, 27 males, 26 females (CNC).

Total specimens examined: 816.

**Discussion.** Geographic variation is evident in scale shape, size, and color, as well as in the average size of specimens. Individual variation is evident in size, distribution of white scales, and color of the dense, elongate scales which impart the general color to the specimens. In a given series, specimens usually agree closely in the coloration and distribution of scales, but often range from very light to a few very dark colored specimens. Usually a number of gray or silvery gray specimens can be observed.

Some specimens from southwestern Colorado and northern New Mexico have very dark yellowish brown scales. These were associated with *Astragalus bisulcatus*. Specimens labeled "Jemez Mts., New Mexico, have a very light red integument. The scales on these are light to very dark reddish brown providing a marked contrast with the white scales.

Specimens from Alaska and the Yukon Territory of Canada have a lighter, yellowish to grayish vestiture. Individual scales are narrow, leaving the integument broadly exposed.

A single female specimen from northeastern Nevada was examined which is unique in several characters. It is small, 2.5 mm in length, with scales very broad, elongate-oval, and relatively sparse, and integument broadly visible. The pedi-

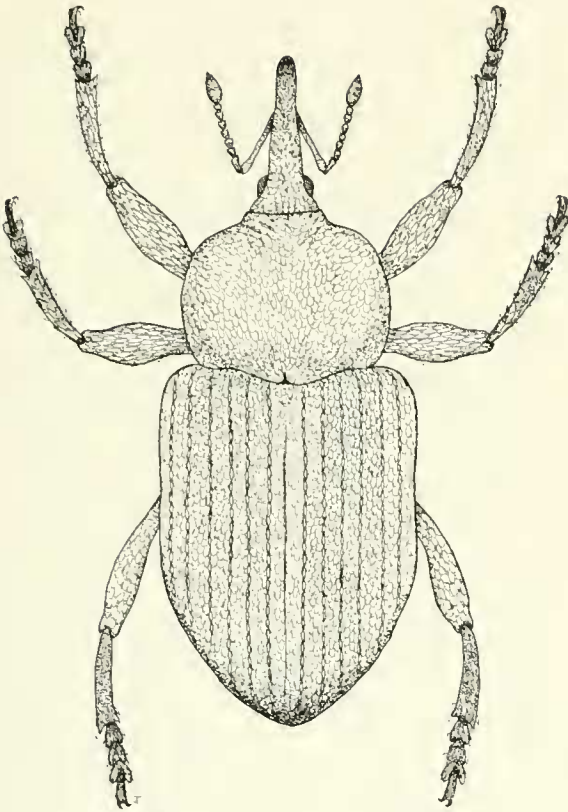


Fig. 1. Dorsal view of *Tychius tectus*.

cel of the antenna is longer than the next four segments combined.

Five specimens examined from Kamela, Oregon, average 3.9 mm in length and have very elongate, narrow rostra which in both sexes are slightly longer than the prothorax. In these the rostra are finely tapered from the base to the apex and amuncate distad of the antennal insertion, but the distal portions are deeply rugulose.

The specimens from Nevada, Oregon, Alaska, and the Yukon Territory have extralimital distributions (Fig. 19).

### *Tychius semisquamosus* LeConte

(Figs. 9, 21)

*Tychius semisquamosus* LeConte (not Fause, 1893). 1876, Proc. Amer. Philos. Soc., 15:217-218 (Lectotype here designated: female, Fort Tejon, California, MCZ type 5229; Paralectotype, female, same locality, MCZ, type 52292); Casey, 1892, Ann. New York Acad. Sci., 6:418.

*Miccotrogus semisquamosus*: Klima, 1934, Coleopterorum Catalogus, 29(138):32.

This species may be distinguished from other North American representatives of the genus

by the multiple, confused, as opposed to single, uniform, median rows of long, narrow, light to dark reddish brown scales on the elytral interspaces; by the absence of fine, erect setae on the abdomen; and by the asymmetrical apical portion of the median lobe of the male genitalia (Fig. 9). It is doubtfully distinct from *T. lamellosus* Casey but can be distinguished by the following characters: the elongate-oval, white scales on the elytral interspaces are very sparse and rarely imbricated, and the rostrum is not finely acuminate and the average size is smaller.

**Description.** Male: length 2.5 mm, width 1.1 mm; integument black to piceous, appendages light to dark reddish brown; vestiture of white to dark reddish brown scales.

Rostrum shorter than prothorax, antennal insertion on distal fourth; moderately evenly arcuate in dorsal profile; in dorsal aspect strongly, evenly tapered from base to apex, frons 2.9 times wider between dorsal margin of eyes than rostrum at apex; distal portion strongly tapered, smooth, shining, pits and rugae shallow. Vestiture of elongate, broad, strigose, recumbent, apically rounded scales of uniform shape; distal portion glabrous except for sparse, fine setae around apical portion of scrobe.

Antennal funicle seven-segmented; pedicel as long or longer than next three segments combined; setae broad, elongate, apically rounded.

Pronotum wider than long, about 1.5 times wider at base than at apical constriction; sides evenly, prominently arcuate. Vestiture complex, consisting of long, narrow, apically rounded or pointed, recumbent, dark reddish brown, strigose scales covering dorsum and extending about half way down sides; integument broadly visible on dorsum, scales on lower portion of sides oval to elongate-oval, nonstrigose, light reddish brown, extending dorsally intermingled with long, narrow scales forming broad lateral vittae on dorsum; sparse oval scales scattered throughout on dorsum, also forming small, median, dorsal, basal patch.

Elytra nearly parallel-sided in basal two thirds, broadly rounded to apices; in dorsal profile nearly flat in basal half, declivity broadly, evenly rounded. Vestiture on interspaces of sparse, scattered, round to elongate-oval, sometimes slightly imbricated, recumbent, nonstrigose white to very light reddish brown scales, much denser, darker, and more broadly imbricated on interspace one. Each interspace with confused, multiseriate rows of long, narrow, apically rounded or pointed, dark reddish brown, usually suberect, strigose scales; scales not denser on intervals two through four. Strial setae narrow,

about half as wide as long, narrow scales on interspaces, usually lighter in color.

Ventral surface with round to elongate-oval, recumbent, slightly imbricated, nonstrigose, white to light reddish brown scales; some scales slightly narrower and suberect, especially on sterna four and five; no discrete transverse rows of elongate, fine, hairlike setae. Sternum five with deep median fovea.

Femur elongate, apical half slightly swollen, apical ventral emarginations prominently developed, metafemur lacking minute tooth on proximal portion of apical ventral emargination. Vestiture of elongate-oval, recumbent, white to light reddish brown, nonstrigose scales, and long, narrow, strigose, white or light reddish brown, apically truncate or rounded, strigose scales; no fine, erect, hairlike setae.

Tibiae mucronate, mucrones shorter than tarsal claws, protibia with larger mucro; vestiture of long, narrow, strigose scales, and fine, erect, light brown setae on apical portion, rarely with sparse elongate-oval scales.

Tarsi dorsally with long, narrow scales and fine hairlike setae; basal process of claw about two thirds as long as claw.

Male genitalia (Fig. 9) with apical portion of median lobe strongly asymmetrical; apical, dorsal, median membranous area elongate, weakly defined posteriorly; median struts clavate.

Female: length 2.3-2.7 mm, rostrum narrower, slightly more acuminate in distal half, antennal insertion near middle. Tibial mucrones slightly smaller.

**Host.** Unknown.

**Distribution.** (Fig. 21).

California: T. L. Casey, coll., 1 male (USNM); Argus Mts., V-1891, 1 female (USNM).

Total specimens examined: 4.

**Discussion.** The structure of the male genitalia (Fig. 9) is similar to that of *T. lamellosus* (Fig. 8). Examination of more material may indicate synonymy between these two. The LeConte specimens and the male in the Casey collection are small and have very sparse elongate-oval scales on the elytra. The female from the Argus Mountains of California has denser elongate-oval scales and is somewhat larger.

### *Tychius lamellosus* Casey

(Figs. 8, 21)

*Tychius lamellosus* Casey, 1892, Ann. New York Acad. Sci., 6: 418-419 (Holotype: male, Utah, USNM 36755, T. L. Casey collection).

*Miccotrogus lamellosus*: Klima, 1934, *Colcopterorum Catalogus*, 29: 138-139.

This species is distinguished from other North American representatives of the genus by the multiple, confused, as opposed to single, uniform median rows of long, narrow scales on the elytral interspaces; by the absence of fine, erect setae on the abdomen; by the finely acuminate rostrum; and by the asymmetrical apical portion of the median lobe of the male genitalia (Fig. 8). It is doubtfully distinct from *T. semisquamosus* LeConte but can be distinguished by the characters enumerated in the diagnosis of that species.

**Description.** Male: length 2.4-3.3 mm, width 1.2-1.5 mm; integument black on pronotum, black to piceous on elytra, appendages light to dark reddish brown; vestiture of white to dark reddish brown scales.

Rostrum shorter than prothorax, antennal insertion on distal fourth; in lateral aspect moderately to slightly, evenly, arcuate in dorsal profile; in dorsal aspect strongly tapered from base to tip, frons 1.8-2.5 times as wide between dorsal margin of eyes as rostrum at extreme apex; distal portion finely acuminate, smooth, shining, pits very shallow or absent. Vestiture of long, narrow, recumbent, or suberect, pointed or wedge shaped, strigose, light to dark reddish brown scales; distal portion glabrous except for sparse, fine setae around apical portion of scrobe.

Antennal funicle seven-segmented; pedicel nearly as long as next three segments combined, setae very fine, hairlike.

Pronotum wider than long, 1.5 times wider at base than at apical constriction; sides evenly, prominently arcuate. Vestiture complex, consisting of narrow, dorsal, median vitta of long, narrow, strigose, and round to oval nonstrigose, white scales, usually extending to anterior margin but often confined to basal portion; long, narrow to broad, recumbent, strigose, apically pointed to truncate, light to very dark reddish brown scales covering dorsum and dorsal half of lateral surface; lower portion of sides with round to elongate-oval, white to reddish brown, nonstrigose scales which extend dorsally forming broad, lateral, vittae in dorsal aspect; usually several nonstrigose scales intermingled with long, narrow scales on dorsum.

Elytra parallel sided in basal two thirds, broadly rounded to apices, widest just behind humeri; in dorsal profile nearly flat in basal half to two-thirds, declivity broadly, evenly rounded. Vestiture on interspaces of nearly uniform biseriate to triseriate rows of round to elongate-oval, slightly imbricated, recumbent, nonstrigose, white to very light reddish brown scales, usually



more broadly imbricated on intervals one and five through seven, darker in color and denser on interspace one; each interspace with confused uniseriate or multiseriate rows of long, narrow, apically truncate or pointed, light to dark reddish brown, suberect, strigose scales which are usually denser on interspaces two through four; setae arising from stria punctures narrow, light colored, hairlike.

Ventral surface densely clothed with round to elongate-oval, recumbent, broadly imbricated, nonstrigose white scales, often some scales slightly narrower and suberect, especially on sterna four and five; no discrete transverse rows of elongate, fine, hairlike setae. Sternum five with deep median fovea.

Femur elongate, narrow, apical half slightly swollen. Apical, ventral, emargination weakly developed; metafemur often with minute tooth or spine on proximal portion of emargination. Vestiture of elongate-oval, recumbent, white scales and long, narrow, white or very light reddish brown apically truncate or rounded, strigose scales; no fine, erect, hairlike setae.

Tibiae mucronate, mucrones usually shorter than tarsal claws, lacking obtuse tooth on dorsal portion, usually largest mucro on protibia. Vestiture of long, narrow, strigose scales, and fine, erect, light brown setae on apical portion, rarely with sparse elongate-oval scales.

Tarsi dorsally with long, narrow scales, and hairlike white setae, claw with basal process about two-thirds as long as claw.

Male genitalia (Fig. 8) with apical portion of median lobe asymmetrical; apical, dorsal, median membranous area elongate, strongly defined posteriorly; median struts weakly clavate.

Female: similar to male except rostrum longer, more slender, antennal insertion median, distal portion very smooth, long, finely acuminate; slightly larger, length 2.4-3.4 mm; mucrones on tibiae slightly smaller.

**Hosts.** *Astragalus beckwithii*, *A. drummondii*, *A. lentiginosus* var. *palens*, and *A. lonchocarpus*.

**Distribution.** (Fig. 21).

British Columbia: Oliver, 2 mi. W., V-29-58, H, and A. Howden, "on vetch," 4 males, 3 females (CNC).

Colorado: Boulder, VI-13-61, J. R. Stainer, 1 female (CNC); Garfield Co., Grand Valley, 8 mi. W., VI-4-69, W. E. Clark, *A. lonchocarpus*, 1 male, 3 females (WEC); San Miguel Co., Placerville, 4 and 6 mi. N.W. and 1 mi. N.E., VI-3-69, W. E. Clark, *A. lonchocarpus*, 16 males, 29 females (WEC); LaPlata Co., Bayfield, 16 mi. E., V-31-69, W. E. Clark, *A. lonchocarpus*, 29 males, 30 females (WEC); Archuleta Co., Pagosa Springs, 21 mi. W., V-31-69, W. E. Clark, *A. lonchocarpus*, 7 males, 14 females (WEC).

New Mexico: Rio Arriba Co., Chama, 17 mi. N.W.,

V-31-69, W. E. Clark, *A. lonchocarpus*, 7 males, 19 females (WEC); Rio Arriba Co., Cebolla, 2 mi. S. and 15 mi. S.W., V-31-69, W. E. Clark, *A. lonchocarpus*, 60 males, 65 females (WEC); Rio Arriba Co., Coyote, 8 mi. W., VI-1-69, W. E. Clark, *A. lonchocarpus*, 7 females (WEC); Sandoval Co., Jemez Springs, 3 mi. N.E., VI-1-69, W. E. Clark, *A. lonchocarpus*, 12 males, 5 females (WEC); 1923, Edith W. Mark, 4 females (CI); Jemez Mts., VI-4, and VI-26, J. Woodgate, 6 males, 8 females (CAS), VI-4, Shoemaker, 2 males (USNM); Ft. Wingate, VI-VII, 5 females (USNM).

Utah: Utah Co., Provo, 1 mi. S.E., V-15, 22, 24-66, 67, 68, W. E. Clark, *A. beckwithii*, 71 males, 50 females (WEC); Utah Co., Provo, Mouth Rock Canyon, V-3, 10, 21, 69, W. E. Clark, *A. beckwithii*, 113 males, 110 females (WEC); Utah Co., Lethi, 13 mi. W., V-10-69, W. E. Clark, *A. beckwithii*, 3 males, 1 female (WEC); Utah Co., Provo Canyon, VI-1-68, W. E. Clark, 1 male (WEC); Arches National Monument, V-10-68, W. E. Clark, *A. lentiginosus* var. *palens*, 9 males 6 females (WEC).

Wyoming: Fremont Co., Lander, 14 mi. S., VI-14-69, W. E. Clark, *A. drummondii*, 12 males, 10 females (WEC).

Total specimens examined: 677.

**Discussion.** Specimens examined from Utah have the antennal insertion very near the tip of the rostrum as do specimens from British Columbia. The most noticeable variation is in the color, shape, and density of the long, narrow, reddish brown scales on the pronotum and elytral interspaces. In specimens from Provo, Utah, these scales range from nearly the color of the round nonstrigose scales to very dark reddish brown with a corresponding darkening of the round, nonstrigose scales. In all specimens examined these scales have bluntly pointed apices. Specimens from southwestern Colorado and northwestern New Mexico have the elongate scales rather light orangish brown and very broad and rounded at the apices. Specimens taken on *A. drummondii* near Lander, Wyoming, are very light in color, with the long, narrow scales barely darker than the round, nonstrigose scales. Specimens from British Columbia are very similar to the Wyoming specimens. Specimens from Arches National Monument, Utah, average smaller in size than Provo specimens and more nearly resemble *T. semisquamosus* in distribution of scales and size.

Color and shape of the long, narrow scales vary in a cline from British Columbia, where they are narrow and light in color, to New Mexico, where they are broad, darker, and orangish brown.

*Tychius badius*, n. sp.

(Figs. 5, 21)

This species is probably closely related to *T. lamellosus* Casey, but differs by the following

characters, the median lobe of the male genitalia has lateral prominences on the apical portion (Fig. 5); the long, narrow, scales on the elytral interspaces are nearly always in single, uniform median rows while in *T. lamellosus* they are usually in multiseriate rows; the basal portion of the rostrum is wider in lateral aspect; and the scales on the elytra are broader and more densely imbricate.

**Description.** Male; length 3.1 mm, width 1.5 mm; integument black to piceous, appendages light reddish brown. Vestiture of creamy white to reddish brown scales.

Rostrum slightly shorter than prothorax; swollen in basal fourth then slightly arcuate in apical two-thirds; antennal insertion in apical third; distad of antennal insertion smooth, shining, with sparse, shallow, lateral impressions; finely acuminate to apex; in dorsal aspect prominently tapered from base to apex, frons 1.7 times as wide between dorsal margin of eyes as rostrum at apex. Scales above antennal insertion of uniform size and shape, long, narrow, recumbent, apically rounded, no erect hairlike setae. Scrobe with elongate, suberect setae around anterior margin; extreme apical portion with sparse, very fine setae.

Antennal funiculus seven-segmented; pedicel nearly twice as long as next two segments combined.

Pronotum 1.2 times as wide as long; sides prominently arcuate, 1.6 times wider at base than at apical constriction. Scales of two distinct types, long, narrow, pointed, light reddish brown scales on dorsum and halfway down sides; median dorsal vitta of broad, oval, white scales; lower portion of sides with oval, white scales which extend dorsally and are densely intermingled with the long, narrow scales on dorsum.

Elytra 1.6 times as long as wide, sides parallel to apical fourth then evenly rounded to apices; nearly flat in basal two-thirds in dorsal profile. Each interspace with double or triple rows of round to elongate-oval, light brown, densely imbricate, recumbent scales; scales on interspace one denser and more broadly imbricate. Each interspace with single median row of long, narrow, recumbent, light reddish scales, single rows breaking up into irregular clusters basally on interspace two, around humeri, and at scattered places all over elytra. Strial setae narrow, hairlike, white.

Ventral surface with round to oval, white scales; those on median surface of venter with plumose margins, some scales on apical portion of abdomen elongate and suberect; no distinct

transverse rows of erect, fine setae. Sternum five with shallow median fovea.

Femur with prominent, apical, ventral emargination; sometimes with minute tooth on proximal portion of emargination. Vestiture of round to oval, nonstrigose and long, narrow, strigose scales.

Tibiae mucronate, mucrones shorter than trasal claws; vestiture of long, narrow scales and suberect fine setae.

Tarsi clothed with elongate setae; claws with broad, connate basal processes.

Male genitalia (Fig. 5) with prominent lateral prominences on apical portion of median lobe; apical, dorsal, median membranous area nearly round, sharply defined posteriorly, median struts very stout, not clavate.

Female: slightly longer, rostrum longer, more finely tapered, 1.9 times as wide at apex as frons between dorsal margins of eyes, antennal insertion median.

**Type Locality.** COLORADO: LaPlata Co., Mancos, 7 mi. E.

**Type Material.** Male holotype, female allotype, 15 males and 11 females, paratypes taken at the type locality, May 30, 1969, by W. E. Clark, sweeping *Astragalus scopulorum*. The holotype and allotype are deposited in the U.S. National Museum, Washington, D.C.; two male and two female paratypes are deposited in the Brigham Young University collection, Provo, Utah; the remaining 23 paratypes are retained in the author's collection.

#### Distribution. (Fig. 21).

Colorado: Archuleta Co., Pagosa Springs, 15 mi. S.E., V-31-69, W. E. Clark, 2 males, 19 females, *Astragalus bisulcatus* var. *hcydenianus*, (WEC); "Colo." Wickham collection, 1 male (USNM).

Total specimens examined: 50.

**Discussion.** There is a conspicuous difference in the size of the Mancos and Pagosa Springs specimens. Males from Mancos range from 3.0-3.4 mm, and females range from 3.2-3.4 mm in length; males from Pagosa Springs range in length from 2.5-2.8 mm, females from 2.6-3.0 mm. Males from Pagosa Springs average 0.52 mm, and females 0.55 mm shorter than specimens from Mancos.

#### *Tychius prolixus* Casey

(Figs. 6, 21)

*Tychius prolixus* Casey, 1892, Ann. New York Acad. Sci., 6:419-420 (Holotype: male, Nevada, USNM 36756, T. L. Casey collection). Tanner, 1966, BYU Sci. Bull., Biological series, 8(2):26. Klima, 1934, *Coleopterorum Catalogus*, 29(138):21.

*Tychius (Paratychius) prolixus* Casey, 1910, Can. Entomol., 42:135 (established *prolixus* as type of subgenus *Paratychius*).

*Tychius (Paratychius) imbricatus* Casey, 1910, Can. Entomol., 42:135-136 (Holotype: female, San Diego, California, USNM 36757, T. L. Casey collection).

This species most closely resembles *T. lamellosus* but can be easily distinguished by the six rather than seven antennal funicular segments, by the denser, more broadly imbricated scales on the elytra, and by the symmetrical apical portion of the median lobe of the male genitalia (Fig. 6).

**Description.** Male: length 2.6-4.0 mm; integument piceous to black, rostrum and appendages light to dark reddish brown; vestiture of white to dark reddish brown scales.

Rostrum nearly as long or slightly longer than prothorax; antennal insertion in distal third; nearly straight distally; from dorsal aspect strongly, evenly tapered from base to apex, frons 2.0-2.5 times wider between dorsal margin of eyes than rostrum at extreme apex, distal portion tapered, not finely acuminate, smooth, shining, pits dense, shallow. Vestiture of stout, broad, to long, narrow, wedge-shaped to apically rounded, decumbent, strigose, white to dark reddish brown scales; no distinct, erect, hairlike setae; distal portion glabrous except for sparse, small scales around apical portion of scrobe.

Antennal funiculus six-segmented; pedicel about equal in length to next three segments combined; setae long, hairlike to clavate.

Pronotum wider than long, about 1.6-2.0 times wider at base than at apical construction; sides slightly arcuate in basal third, strongly arcuate indistal third. Vestiture complex, dorsal median, vitta, of long, narrow, strigose, and round to oval, nonstrigose white scales; long narrow, recumbent, strigose, apically truncate to rounded, light to very dark reddish brown; strigose scales covering dorsum and upper half of sides; lower portion of sides with round to elongate-oval, white to light reddish brown, nonstrigose scales which extend dorsally, forming broad lateral vittae from dorsal aspect; usually several nonstrigose scales intermingled with long, narrow scales on dorsum.

Elytra parallel sided on basal two-thirds, broadly rounded to apices; in dorsal profile nearly flat in basal half to two-thirds; declivity broadly, evenly rounded. Vestiture on interspaces of nearly uniform biseriate to triseriate rows of round to oval, broadly imbricated, recumbent, nonstrigose, white to reddish brown scales, denser and darker on interspace one, usually darker

in color on interspaces two through four. Each interspace with uniform median rows of long, narrow, recumbent, apically truncate or rounded, light to dark reddish brown, strigose scales, usually in uniseriate rows on intervals one, three and five to seven; multiseriate rows on interspaces two and four. Strial setae narrow, white, hairlike.

Ventral surface with round to elongate-oval, recumbent, broadly imbricated, nonstrigose white scales; often several scales suberect, especially on sterna four and five; sometimes with discrete transverse rows of elongate, fine hairlike setae. Sternum five with deep median fovea.

Femur elongate, apical half moderately swollen; apical, ventral emargination usually prominent; metafemur often with minute tooth or spine on proximal portion of emargination. Vestiture of elongate-oval, recumbent, white scales and long, narrow, strigose, light, reddish brown, apically truncated or rounded, strigose scales; no fine, erect, hairlike setae.

Tibiae mucronate, mucro usually shorter than tarsal claw; lacking obtuse tooth on dorsal portion; usually mucro on protibia largest. Vestiture of long, narrow, strigose, white to light reddish brown scales, elongate-oval, white nonstrigose scales, and fine, erect, light brown setae on apical portions.

Tarsi dorsally with long, narrow scales and hairlike, white setae; claw with basal process about two-thirds as long as claw.

Male genitalia (Fig. 6) with apical portion of median lobe rounded; apical dorsal, median membranous area nearly round, strongly defined posteriorly; median struts fine, clavate.

Female: length 2.7-4.1 mm; rostrum longer, more slender, often straighter; antennal insertion median; tibial mucrones slightly smaller.

**Hosts.** *Astragalus amphioxys*, *A. douglasii*, *A. utahensis*, and *A. lentiginosus* (Tanner, 1966).

**Distribution.** Fig. 21).

Arizona: Morrison, Hubbard and Schwarz, 1 male (USNM); (Sta. Rita, N.F.), M. Chrisman, *Juniperus*, 1 male (USNM); Snowflake VIII-1-30 Ballantyne, *Astragalus diphyus*, 1 female (UA), V-27-32, E. F. Russell, "swept from loco weed," 1 female (USNM); St. John, VI-7-32, E. F. Russell, "reared from loco plants," 2 males (USNM).

California: 2 males (UK); Liebeck, 2 females (PANS); Aguanga, V-12-29, 1 male (CNC); Antioch, V-18-36, 1 female (CNC); Chino, VII-20-08, 1 female (USL); Elsinore, III, A. Feynes Coll., 2 males, 1 female (CAS); Hemet Reservoir, San Jacinto Mts., V-22-40, 1 female (CIS); Jacumba, IV-17-16, J. O. Martin, 2 males, 1 female (CAS); Riverside Co., Keen Camp, VI-6, 12-17, E. P. Van Duzec, 1 male (CAS); 4 mi. E. Keen Camp, Hemet Res. 4500', VII-1-65, C. D. Johnson,

*Astragalus douglasii*, 7 males, 3 females (CWO); Laguna Mts., VII-6-29, R. H. Beamer, 2 females (UK); San Diego Co., La Mesa, III-20-28, H. C. Barber, 3 males (USNM); Lebec, IV-15-28, A. C. Davis, 2 males (CNC); 1 male (CNC); Los Angeles Co., Coquillett Coll., 5 males, 2 females (USNM), Van Dyke Coll., 2 males (USNM), San Diego Co., Pacific Beach, VI-23-37, C. Gammon, "reared from loco weed," 1 female (CAS); Riverside, III-18-40, C. Bammeres "flowers of loco weed," 1 male, 3 females (LA); 2 males, 2 females (USNM); San Diego Co., IV-8-25, E. C. Van Dyke, 1 male, 5 females (CAS); F. E. Blaisdell, 1 male, 2 females (CAS); F. H. Parker Coll., 4 males, 2 females (UA), D. K. Duncan, 2 males, 2 females (UA); IV-23-20, E. P. Van Duzee, 1 female (CAS); Riverside Co., San Jacinto Mts., VII-20-29, 1 male (UK); San Luis Obispo, III-14-08, I. J. Condit, *Astragalus*, 2 males, 3 females (USNM); S. Bernardino Co., 2 males, 4 females (USNM), Buena Ventura, Liebeck Coll., 8 males, 4 females (MCZ); Upland, IV-5-20, A. Feynes Coll., 2 males, 2 females (CAS); IV, Wickham Coll. 1 male, 2 females (USNM), 1 female (MCZ); Monterey Co., King City, IV-2-60, G. A. Toschi, one male (CWO).

New Mexico: W. G. Dietz, 1 male (MCZ); Sandoval Co., San Ysidro, 13 mi. N.W., VI-1-69, W. E. Clark, *Astragalus amphioxys*, 9 males, 4 females (WEC).

Texas: Brewster Co., 17 mi. S. Alpine, 4000', VI-6-70, L. and C. W. O'Brien, 1 male, 1 female (CWO); Davis Co., 10 mi. S. Toyahvale, V-31-70, R. M. Murray, 1 female (WEC).

Utah: Utah Co., Provo, Mouth Rock Canyon, V-19-69, W. E. Clark, *Astragalus utahensis*, 10 males, 9 females (WEC); Utah Co., Provo, V-9-67, V-27-67, D. R. Harris, *Astragalus utahensis*, 7 males, 1 female (WEC).

Total specimens examined: 153.

**Discussion.** Specimens from Utah and New Mexico have longer and straighter rostra in both sexes than do specimens from California. The possession of six rather than seven antennal funicular segments does not justify giving this taxon the rank of subgenus because of its apparent close relationship to other members of the *T. semisquamosus* species group, especially *T. lamellosus*.

### *Tychius soltau* Casey

(Figs. 11, 20)

*Tychius soltau* Casey, 1892, Ann. New York Acad. Sci., 6:416 (Holotype: male, Laramie, Wyoming, USNM 36754, T. L. Casey collection).

*Miccotrogus soltau*: Klima, 1934, *Coleopterorum Catalogus*, 29(138):32.

This is the most widely distributed species in a group of very closely related species within the *T. semisquamosus* species group. This species can be distinguished from other members of the *T. semisquamosus* species group by the possession of erect hairlike setae on the abdominal sternum. The male genitalia (Fig. 11), which lack the apical lateral prominences of *T. badius* (Fig.

5) and *T. hirsutus* (Fig. 14) and have the apical median membranous area sharply defined posteriorly rather than not sharply defined as in *T. phalarus* (Fig. 7), serve to distinguish *T. soltau* from other members of the group.

**Description.** Male length, 2.6-3.8 mm, width 1.2-1.8 mm; integument piceous to black, appendages piceous to light reddish brown. Vestiture complex, of white to dark reddish brown scales.

Rostrum shorter than prothorax, length of rostrum 20 to 25 percent of total body length; antennal insertion in apical fourth; usually strongly arcuate in basal half, nearly straight apically, but often evenly arcuate or straight entire length; from dorsal aspect tapered evenly from base to apex, frons 1.7-2.5 times wider between dorsal margin of eyes at extreme apex, distal portion tapered but not strongly acuminate, smooth and shining, large, shallow pits especially dense laterally. Vestiture of long, narrow, apically truncate or rounded, strigose scales, usually scales on lower portion of sides smaller, lighter colored, white to light reddish brown, scales on dorsal portion dark reddish brown with several lighter colored, narrow, erect or suberect setae especially dense distally.

Antennal funiculus seven-segmented; pedicel as long or longer than next three segments combined; setae broad, elongate.

Pronotum wider than long 1.6-1.8 times wider at base than at apical constriction; sides in dorsal aspect evenly, broadly rounded. Vestiture of narrow, dorsal, median vitta of long, narrow, strigose, and round to oval white scales; long, narrow, light to very dark reddish brown, strigose scales covering most of dorsum and upper portion of sides; lower portion of sides with round to elongate-oval, white or light reddish brown, nonstrigose scales which extend dorsally forming broad, lateral vittae from dorsal aspect, nonstrigose scales usually intermingled with long, narrow scales on dorsum.

Elytra parallel-sided in basal two-thirds, broadly rounded to apices; in dorsal profile nearly flat on disc, declivity broadly evenly rounded. Vestiture on interspaces of round to oval, broadly imbricated, recumbent, nonstrigose, white to dark reddish brown scales, lighter in color on interspaces five to eight; each interspace with uniform row of scales similar to long, narrow scales of pronotum. Strial setae narrower than scales on interspaces.

Ventral surface with round to elongate-oval, white to light reddish brown, recumbent, imbricated scales; each abdominal sternum with dis-

crete transverse row of erect, narrow, hairlike setae; metasternum with some elongate, recumbent, narrow setae; sternum five with deep median fovea.

Femora long, narrow to stout, apical portion swollen, ventral emargination well developed in specimens with stout apical portion; metafemur often with minute tooth or spine on proximal portion of apical, ventral emargination. Vestiture of elongate-oval, recumbent, usually light to dark reddish brown scales, and long, narrow, strigose, suberect, usually white or very light reddish brown scales.

Tibiae mucronate, mucrones usually as long as tarsal claws, often with obtuse tooth on dorsal portion, usually largest on protibia. Vestiture of elongate, oval, and long, narrow scales, and fine, hairlike setae.

Tarsi dorsally with long, narrow scales; claws with basal process short, about half as long as claw.

Male genitalia (Fig. 11) with apex of median lobe obtusely rounded; apical, dorsal, median membranous are a small, transversely oval, strongly defined posteriorly; median struts slightly clavate.

Female: length 2.6-3.9 mm; rostrum more finely tapered distad of antennal insertion; mucrones on tibiae usually smaller.

**Hosts.** *Astragalus flavus* var. *flavus* and *A. flexuosus*.

**Distribution.** (Fig. 20).

Arizona: C. V. Riley, 1 male (USNM); Peach Springs, VIII-25, C. W. Leng, 1 female (BYU).

Colorado: Denver, IV-2, H. Soltau, 1 male (USNM); Platte Can., X-27-1889, H. Soltau, 1 male (USNM).

Manitoba: Aweme, VI-26-30, R. M. White, *Astragalus flexuosus*, 1 female (CNC).

Montana: 1 male (INHS), 1 male (USNM), 1 female (PANS); Helena, Hubbard and Schwarz, 1 female (USNM).

Nebraska: Indianola, H. Soltau, 2 males (USNM). New Mexico: Sandoval Co., San Ysidro, 13 mi. N.W., V-1-69, W. E. Clark, 1 male (WEC).

North Dakota: Tower City, VI-3-05, G. I. Reeves, 1 female (USNM).

Saskatchewan: Last Mtn. Lake, VI-5-33, Wickham Coll., 1 male (USNM).

South Dakota: Pennington Co., Pactola Reservoir, VI-17-68, W. E. Clark, 1 female (WEC).

Texas: Davis Mts., IV-26-24, J. O. Martin, 1 male, 1 female (CAS); Upton Co., Rankin, VI-3-70, C. W. Neeb, 1 male (TAM).

Utah: Cache Co., Logan, V-24-51, H. G. Egoeue, 2 females (BYU); Uintah Co., Vernal, 14 mi. S.W., V-17-69, W. E. Clark, *Astragalus flavus*, 10 males, 8 females (WEC).

Wyoming: Albany Co., Laramie, 20 mi. N.W., V-6-69, W. E. Clark, *Astragalus flavus*, 13 males, 8 females (WEC); Fremont Co., Lander, 14 mi. S., VI-14-

69, W. E. Clark, 1 male, 1 female (WEC); Carbon Co., Medicine Bow, 32 mi. N., VI-6-69, W. E. Clark, 1 male, 1 female (WEC).

Total specimens examined: 63.

**Discussion.** The holotype is small, 3.0 mm in length, unusually narrow, and dark in color. Specimens taken in New Mexico, Arizona, and Colorado are often somewhat larger in size but agree in characters of the male genitalia. Most of the specimens at hand are single or at best pairs of specimens from widely separated areas.

I have examined a female from Montana in the Casey collection identified as *T. aratus*, but it is actually *T. soltau*. This specimen is fairly large and the erect setae on the intervals are finer than those of the type of *T. soltau*.

*Tychivus montanus* n.sp.

(Figs. 18, 20)

This species appears closely related to *T. soltau* Casey. The most reliable character for separating the two species is the structure of the apical portion of the median lobe of the male genitalia (Fig. 18) which possesses weakly developed lateral, apical, prominences in *T. montanus* but not in *T. soltau*. The rostrum is generally as long or slightly longer than the prothorax, nearly straight or very slightly arcuate, and usually expanded at the extreme apex. The pits on the distal portion of the rostrum are slightly deeper than in *T. soltau*. The median dorsal patch of white scales does not extend the entire length of the pronotum, as in *T. soltau*, but forms a small, basal patch. The absence of erect hairlike setae or recumbent, long, narrow, white scales on the metasternum and the first visible abdominal sternite is also diagnostic.

**Description.** Male: length 3.4 mm, width 1.5 mm; integument light reddish brown, darker on dorsal surfaces. Vestiture complex, of white to dark reddish brown scales.

Rostrum slightly shorter than prothorax, rostrum length about 28 percent of total body length; antennal insertion in apical third, evenly, slightly arcuate from base to apex in dorsal profile; slightly tapered from base to apex, sometimes slightly expanded at apex, frons about 1.5 times wider between dorsal margin of eyes than rostrum at apex; distal portion stout, not more strongly tapered than proximal two-thirds; distal third densely, deeply rugulose. Vestiture of long, narrow, apically, rounded, strigose scales; scales on dorsal portion dark reddish brown, several lighter colored, slightly narrower, suberect scales especially dense distally.

Antennal funicle seven-segmented; pedicel as long as next three segments combined; setae long, narrow.

Pronotum about 1.2 times wider than long, 1.6-1.8 times wider at base than at apical constriction; sides prominently, evenly arcuate. Vestiture complex, dorsum with small basal patch of round, and long, narrow, white scales; long, narrow, often suberect, light to very dark reddish brown, apically truncate or pointed, strigose scales covering most of dorsum and upper half of sides; lower portion of sides with round to elongate-oval, white to light reddish brown, nonstrigose scales which extend dorsally forming broad, lateral, light colored vittae from dorsal aspect.

Elytra parallel sided in basal two-thirds, broadly rounded to apices; in dorsal profile nearly flat to very slightly rounded in basal half; declivity broadly, evenly rounded. Vestiture on interspaces of nearly uniform biseriate or triseriate rows of round to oval, broadly imbricated, recumbent, nonstrigose, white to dark reddish brown scales, slightly darker on intervals two through four, lighter and denser on interspace one; each interspace with uniform row of long, narrow, usually apically pointed, suberect, light to dark reddish brown, strigose scales, each scale shorter than width of interspace. Strial setae lighter in color and slightly narrower than long narrow scales on interspaces.

Ventral surface with round to elongate-oval, white, recumbent, nonstrigose scales; abdominal sterna three and five each with discrete transverse row of erect, hairlike setae, which are absent from metathorax and abdominal segments one and usually two. Sternum five with deep median fovea.

Femora long, narrow or swollen apically; apical, ventral emargination usually well developed; metafemur often with minute tooth or spine on proximal portion of emargination. Vestiture of elongate-oval, recumbent, usually light reddish brown, nonstrigose scales and long, narrow, strigose, usually suberect, lighter colored, often white scales.

Tibiae mucronate, mucro on protibia about as long as tarsal claw, mucrones on mesofemur and metafemur smaller, usually mucrones with obtuse dorsal tooth. Vestiture of elongate-oval, usually light reddish brown scales, long, narrow white scales, and very fine, hairlike suberect setae especially dense on apical and ventral portions.

Tarsi dorsally with long, narrow scales; claw with basal process about half as long as claw.

Male genitalia (Fig. 15) with weakly developed lateral apical prominences on median lobe;

apical, dorsal, median membranous area nearly round, strongly defined posteriorly; median struts very fine, strongly clavate.

Female: rostrum length 27 percent to 29 percent of total body length; total body length 3.4-3.5 mm; antennal insertion median.

**Type Locality.** MONTANA: Helena.

**Type Material.** Male holotype, female allotype, one male and one female paratype taken at the type locality by Hubbard and Schwarz; on 1-5, all but the male paratype are deposited in USNM; the male paratype is in my personal collection.

**Host.** Unknown.

**Distribution.** (Fig. 20).

In addition to the type material, two specimens from the following localities were examined:

Alberta: Medicine Hat, VI-1-34, J. Carr, 1 female (BYU).

North Dakota: Mandan, F. E. Cobb, 1 female (USNM).

Total specimens examined: 6.

### *Tychius hirsutus*, new name

(Figs. 14, 20).

*Tychius hirtellus* LeConte (not Tourmier, 1873), 1876, Proc. Amer. Philos. Soc., 15:218 (Lecotype here designated: female, Texas, MCZ type 52282).

*Miccotrogus hirtellus*: Klima, 1934, *Colcopterorum Catalogus*, 29(138):30.

This species can be distinguished from its North American relatives by the very fine, elongate, hairlike setae on the interspaces of the elytra, rostrum and appendages. It closely resembles *T. soltau* Casey but can be distinguished from that species by the apical, lateral, projections of the median lobe of the male genitalia (Fig. 14). The rostrum is more finely acuminate in the distal portion, the scales on the pronotum are narrow, leaving the integument broadly visible, and the variation in color between interspaces two to three and four to seven apparent in *T. soltau* is absent.

**Description.** Male: length 2.6-2.9 mm; integument piceous to black, appendages piceous to light reddish brown. Vestiture complex, of white to dark reddish brown scales.

Rostrum shorter than prothorax, antennal insertion in apical fourth, usually evenly, slightly to moderately arcuate in dorsal profile but sometimes prominently arcuate in basal half, nearly straight in distal half; in dorsal aspect tapered evenly from base to apex, frons 2.0-2.5 times

wider between dorsal margin of eyes than rostrum at apex; distal portion strongly tapered, often finely acuminate, pits and rugae shallow. Vestiture of elongate, very narrow, apically pointed or finely acuminate, light to dark reddish brown scales on dorsum and upper portion of sides, usually with smaller lighter colored narrow scales and several light colored round to oval, nonstrigose scales on lower portion of sides; suberect, elongate, hairlike white setae proximad and distad of antennal insertion.

Antennal funicle seven-segmented; pedicel about equal in length to or longer than next three segments combined; setae very fine, elongate.

Pronotum wider than long, 1.6-1.7 times wider at base than at apical constriction; sides evenly, broadly rounded, or nearly parallel in basal half, rounded acutely in distal portion. Vestiture complex, of narrow, dorsal, median vitta of long, narrow, and oval to elongate-oval white scales; elongate, narrow, often semierect, light to dark reddish brown, strigose, scales covering most of dorsum and upper half of sides; integument visible between scales; lower portion of sides with round to elongate-oval, white to dark reddish brown nonstrigose scales which extend dorsally forming broad, lateral vittae from dorsal aspect; usually with several oval scales intermingled with long, narrow scales on dorsum.

Elytra usually broadest at humeri, tapering slightly to apices; in dorsal profile nearly flat on disc; declivity broadly, evenly rounded. Vestiture on interspaces of round to oval, broadly imbricated, recumbent, nonstrigose, white to dark reddish brown scales, slightly denser, and often of different color on interspace one, no obvious color differences on other interspaces; each interspace with uniform median row of narrow, elongate, pointed, erect, white to dark reddish brown, setae.

Ventral surface with round, to elongate-oval recumbent, imbricated, white to light reddish brown, usually plumose margined scales; each abdominal sternum with discrete transverse row of erect, fine, white, hairlike setae; metasternum usually with some elongate, recumbent or suberect, narrow setae, but often with erect very fine setae. Sternum five with deep median fovea.

Femora long, narrow, apical portion not prominently swollen, apical ventral emargination weakly developed; metafemur often with minute tooth on proximal portion of apical ventral emargination. Vestiture of elongate-oval, recumbent, light to dark reddish brown scales, and elongate, pointed, hairlike, erect, white setae, no long, narrow, strigose scales.

Tibiae mucronate, mucro usually as long as tarsal claw, often with obtuse tooth on dorsal portion, mucrones usually of uniform size on all tibiae but often largest on protibia. Vestiture of elongate-oval, recumbent scales and fine, hair-like, erect setae.

Tarsi dorsally with long, narrow, pointed, scales; claw with basal process about two-thirds as long as claw.

Male genitalia (Fig. 14) with apical portion of median lobe bearing prominent lateral projections; apical, dorsal, median membranous area nearly round, strongly defined posteriorly; median lobe very long in comparison to median struts, very heavily sclerotized; median struts clavate.

Female: length 2.7-3.0 mm; antennal insertion median, finely acuminate distally; tibial mucrones slightly smaller.

**Hosts.** Specimens bearing the following host data have been examined: *Astragalus nuttallianus*, beating *Quercus*, and *Prosopis juliflora*.

#### Distribution. (Fig. 20).

New Mexico: Albuquerque, VI-27-33, Wickham and Bowditch, 1 male (USNM), 1 female (MCZ).

Texas: 2 females (PANS); Belfrage, Hubbard and Schwarz, 2 males (USNM); C. V. Riley, 1 male, 2 females (USNM); Bastrop Co., VI-31-58, H. R. Burke, 1 female (TAM); Brazos Co., VI-20-60, H. R. Burke, 1 female (TAM); Collinsworth Co., V-1859, 1 female (TAM); Corpus Christi, III-30-54, D. J. and J. N. Knull, 1 female (OSC); Dallas, V-11-50, E. E. Gilbert, 2 males, 1 female (CIS); Dallas Co., IV-18-40, Kintson, 1 female (CAS); Gillespie Co., VI-1-58, S. Burke, 1 female (TAM); Kerrville, IV, V, VI-4, 5, 18-52, 55, L. J. Bottimer, *Astragalus*, V-4-52, 3 males, 7 females (CNC), IV-4, 13, 20-59, Becker and Howden, beating *Quercus*, 2 males, 1 female (CNC); Llano, IV-21-06, F. C. Pratt, 1 female (USNM); Marfa, VII-11-12, J. W. Green, 1 female (USNM); San Antonio, V-31-03, A. C. Morgan, *Prosopis juliflora*, 1 female (USNM); Jim Wells Co., 7 mi. W. Alice, III-29-70, W. E. Clark, *Astragalus nuttallianus*, 5 males, 4 females (WEC).

Total specimens examined: 46.

**Discussion.** The range of this species and *T. soltau* overlap in western Texas and New Mexico. Some specimens examined from the area have weakly developed lateral apical prominences on the median lobe of the male genitalia which suggests possible intergradation between the two. More study is necessary to determine accurately the relationship between them.

#### *Tychius phalarus*, n.sp.

(Figs. 2, 7, 20)

This species closely resembles *T. soltau* Casey. The most reliable character for separating the two is the apical portion of the median lobe

of the male genitalia (Fig. 7). The apical, median membranous area extends proximad for the greater portion of the length and does not have a distinct posterior limit as in *T. soltau* (Fig. 11). The white scales on the median portion of the dorsum of the pronotum are restricted to a prominent basal patch (Fig. 2) instead of forming a median vitta the length of the pronotum. In most specimens the rostrum is slightly expanded in the extreme distal portion, scales on the rostrum are elongate-oval and pointed rather than parallel sided, scales on the pronotum are narrow and dark in color, oval scales on the femur are white, and the long, narrow scales are dark in color.

**Description.** Male: length 2.8-3.5 mm; integument black to piceous appendages light to dark reddish brown. Vestiture of white to dark reddish brown scales.

Rostrum slightly shorter or about same length as prothorax, length 20 to 28 percent of total body length, antennal insertion on apical fourth; evenly, prominently arcuate from base to apex in dorsal profile. In dorsal aspect prominently, evenly tapered from base to apex, frons 1.8-2.2 times wider between dorsal margin of eyes than rostrum at extreme apex; distad of antennal insertion oblong in cross section, not finely acuminate; smooth, shining, lateral pits shallow; often slightly expanded at antennal insertion and at extreme apex. Vestiture of elongate-oval, apically pointed, white, recumbent scales, and long, narrow, strigose, suberect scales; no fine erect setae, some round, nonstrigose scales on lower portion of sides.

Antennal funicle seven-segmented; pedicel as long or longer than next three segments combined.

Pronotum wider than long, base about 1.7 times wider than apex at apical constriction; sides evenly, prominently rounded; punctures large, evenly spaced, broadly visible on disc. Vestiture complex, large, median, basal, patch of oval, nonstrigose and long, narrow, strigose, white scales; remainder of dorsum and upper portion of sides with long, narrow, pointed, dark reddish brown, strigose scales; lower portion of sides with oval to elongate-oval, white to light reddish brown, nonstrigose scales, some extending to dorsum.

Elytra nearly parallel in basal fourth, broadly rounded to apices, in dorsal profile nearly flat in basal half, declivity evenly, broadly rounded. Vestiture on interspaces of biseriate to triseriate rows of oval, recumbent, white to light reddish brown nonstrigose, broadly imbricated scales; scales on interspace one slightly denser, more

broadly imbricated. Each interspace with median, uniseriate row of long, narrow, strigose, suberect to erect, usually dark reddish brown, apically pointed scales. Strial scales elongate, pointed, white.

Ventral surface with oval, or elongate-oval, imbricated white, plumose margined, nonstrigose scales. Metasternum and abdominal sterna with discrete, transverse rows of suberect to erect, hairlike setae; sternum five with deep median fovea.

Femur long, narrow, apical ventral emargination well developed; often metafemur with minute spine on proximal portion of emargination. Vestiture of elongate-oval, recumbent, nonstrigose scales, and long, narrow, strigose, white to light reddish brown scales.

Tibiae mucronate, mucro on mesofemur and metafemur usually shorter than tarsal claw; mucro on protibia about equal in length to tarsal claw. Vestiture of elongate-oval, nonstrigose and long, narrow strigose scales, and fine, hairlike, usually darker colored setae near apex.

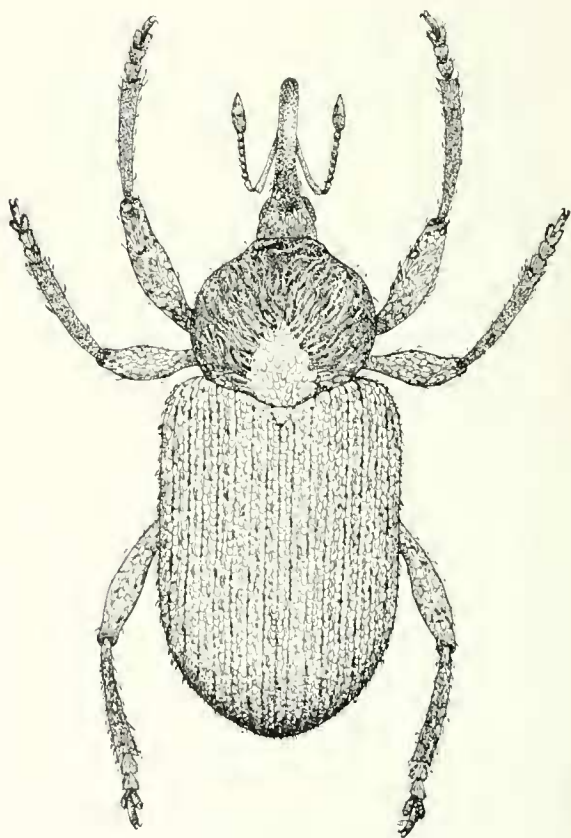


Fig. 2. Dorsal view of *Tychius phalarus*.



Tarsi dorsally with long, narrow scales; claw with short basal process, usually only half as long as claw.

Male genitalia (Fig. 7) with apical portion of median lobe broadly rounded; apical, dorsal, median membranous area not sharply defined, posterior sclerotized margin absent; median struts fine, clavate.

Female: length 2.8-3.6 mm; rostrum usually equal in length to pronotum, narrower, more slender; tibial mucrones generally smaller.

**Type Locality.** ARIZONA: Organ Pipe Cactus National Monument, Dripping Springs.

**Type Material.** Male holotype, female allotype, 16 male and 15 female paratypes taken at the type locality on April 5, 1969, by W. E. Clark, sweeping the host plant. One female paratype was taken at the type locality on April 24, 1953, by A. and H. Dietrich. Deposition of the type material is as follows: holotype and allotype (USNM), 1 male, 1 female paratype (BYU), one female paratype (CAS); the remaining 29 paratypes are retained in the authors collection.

**Host.** *Lotus rigidus*.

**Distribution.** (Fig. 20).

One specimen not included in the type material that was examined.

California: Poway, 1 female (CAS).

Total specimens examined: 35.

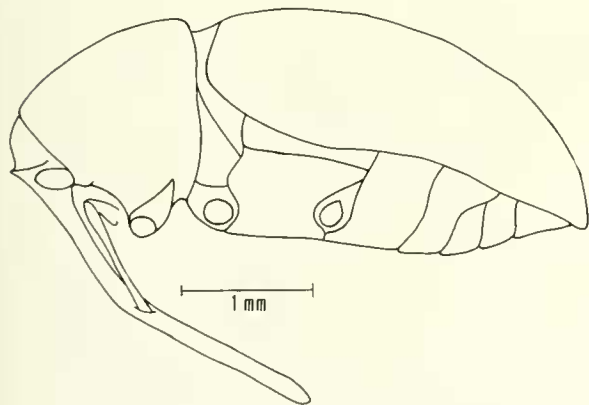
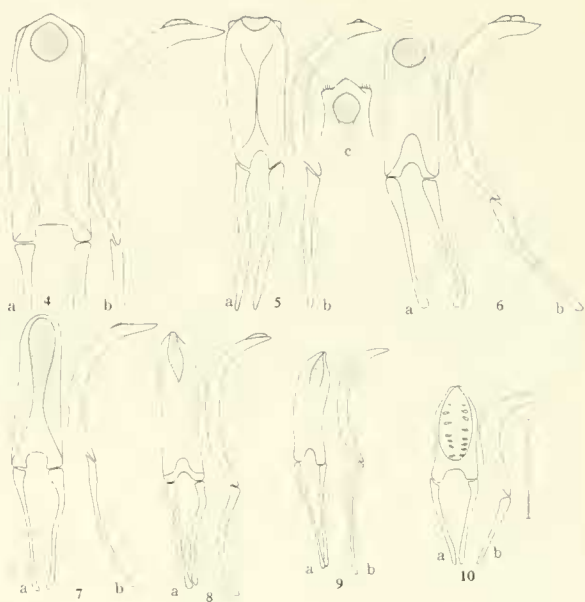


Fig. 3 Lateral view of *Tychius aratus*, female.

*Tychius aratus* Say

(Figs. 3, 4, 19)

*Tychius aratus* Say, 1831, Descriptions of North American curculionides, . . . , p. 26, (reprinted In: LeConte, 1859, The complete writings of Thomas Say, . . . , 1:294) (Male holotype of *Tychius arator* Gyllenhal here designated as neotype of *Tychius*



Figs. 4-10. *Tychius* spp., median lobe of male genitalia; 4, *T. aratus*; 5, *T. badius*; 6, *T. prolixus*; 7, *T. phalarus*; 8, *T. lamellosus*; 9, *T. semisquamosus*; 10, *T. stephensi*; a - dorsal view, b - lateral view, c - dorsal view of apex. Line at right of Fig. 10 represents 1 mm.

*aratus* Say: Missouri, Naturhistoriska Riksmuseum, Stockholm); LeConte, 1876, Proc. Amer. Philos. Soc., 15:432; Gemminger and Harold, 1871, *Catalogus Coleopterorum* 8:2514 (=arator Gyllenhal).

*Tychius arator* Gyllenhal, 1836, In: Schoenherr, Genera et species curculionidum, . . . , 3(1):414-415 (Holotype: male, Missouri, Naturhistoriska Riksmuseum, Stockholm).

*Miccotrogus aratus* Klima, 1934, *Coleopterorum Catalogus*, 29(138):29.

This species differs from other members of the *T. semisquamosus* species group by the unicolorous scales and larger size. The long rostrum in the female (Fig. 3) is unique among known North American *Tychius*.

**Description.** Male: length 4.0-4.4 mm, width 1.8-2.1 mm; integument dark reddish brown to black on body, appendages dark reddish brown; covered by unicolorous, light, tawny scales.

Rostrum longer than prothorax, slightly, evenly arcuate or nearly straight in basal two-thirds in dorsal profile; slightly wider at antennal insertion in lateral aspect; in dorsal aspect slightly, evenly tapered from base to tip, frons 1.4 times wider between dorsal margin of eyes than rostrum at apex; antennal insertion in apical third; evenly tapered to tip in lateral aspect, lateral portion with very deep rugae, dorsal portion with median shiny, smooth area. Vestiture of uniform shape, size and color; distad of an-

temal insertion long, narrow, suberect setae extending two-thirds distance to apex, scales above insertion stouter, no distinct erect hairlike setae.

Antennal funicle seven-segmented; pedicel as long as next two segments combined.

Pronotum 1.0-1.2 times wider than long, sides prominently arcuate, 1.5-2.0 times wider at base than at apical constriction. Scales of two types; long, narrow, recumbent, apically pointed scales on dorsum; sides with broad, oval, recumbent scales, extending dorsally, intermingled with elongate scales halfway up sides, extending to dorsum forming broad lateral vittae from dorsal aspect.

often absent from visible abdominal sternum one. Sternum five with broad, deep, median fovea.

Femur stout, apical, ventral emargination well developed, metafemur with minute tooth on proximal portion of emargination. Vestiture of round, and long, narrow, suberect, strigose scales.

Tibiae with short, stout, mucrones, mucro on protibia largest. Vestiture of sparse round scales and long, narrow, apically pointed, suberect, strigose scales. Tarsi with fine setae and long, narrow, strigose scales dorsally, tarsal claw divergent, basal processes parallel.

Male genitalia (Fig. 4) with apical portion of median lobe bearing lateral prominences, apex rounded; apical, dorsal, median membranous area nearly round, strongly defined posteriorly; median struts clavate.

Female: rostrum extremely long, narrow, nearly half body length. Antennal insertion near middle, apical portion slightly expanded, nearly glabrous entire length. Tibial mucrones slightly smaller than in male.

**Host.** *Astragalus crassicaarpus*.

**Distribution.** (Fig. 19).

Minnesota: Duluth, Daggett, 1 male (LA).

Montana: Mason 1 female (USNM); Bozeman, VI-1-38, D. R. Lindsay, 1 male, (ISU).

Wyoming: Johnson Co., Buffalo, 5 mi. W., VI-20-68, W. E. Clark, *Astragalus crassicaarpus*, 2 males (WEC).

Total specimens examined: 6.

**Discussion.** The "type of *T. aratus* Say was apparently destroyed (LeConte, 1859:vi). A specimen from the Gyllenhal collection in the Stockholm Museum labeled *Tychius aratus* Say was examined. Gyllenhal (1836:414-415) states that this specimen was sent to him by Say and cites *Tychius aratus* Say as a synonym of *T. arator*. LeConte (1876:216) says of *T. arator* that "Say apparently confounded this species with one described by him as *T. aratus*; and Major Gyllenhal suspecting perhaps the existence of some error has, while quoting Say in synonymy, given a different name to the insect received from that author." I have examined the specimen in the LeConte collection labeled *T. arator* and determine it to be *T. liljebladi* Blatchley. The specimen in the Gyllenhal collection sent by Say to Gyllenhal is probably the only authentic Say specimen of *T. aratus* in existence; therefore, it is here designated as the neotype.

The relationship of *T. aratus* to the other members of the *semisquamostus* group is not clear. It appears rather isolated in several features.



Figs. 11-18. *Tychius* spp., median lobe of male genitalia; 11, *T. soltau*; 12, *T. tectus*; 13, *T. liljebladi*; 14, *T. hirsutus*; 15, *T. caesus*; 16, *T. lineellus*; 17, *T. sordidus*; 18, *T. montanus*; a - dorsal view, b - lateral view. Line at right of Fig. 18 represents 1 mm.

Elytra 1.4-1.5 times longer than wide; in dorsal profile nearly flat in basal fourth to one-half, broadly rounded to apices. Sides in dorsal aspect slightly rounded in basal two-thirds, broadly rounded to apices. Each interspace with three or four rows of broad, oval, sometimes pointed, broadly imbricated, nonstrigose scales and with medium uniseriate to multiseriate rows of long, narrow, suberect, strigose scales. Strial scales narrow pointed.

Ventral surface densely clothed with broad to elongate-oval densely imbricated scales and transverse rows of erect setiform scales, these



Fig. 19. Map of North America showing distributions of *Tychius liljebladi* ■, *T. tectus* ●, and *T. aratus* ○.



Fig. 20. Map of the United States showing the distributions of *Tychius stephensi*, *T. sordidus* ●, *T. caesioides* ▼, *T. soltau* ▲, *T. montanus* □, *T. hirsutus* ■, and *T. phalarus* ◆.

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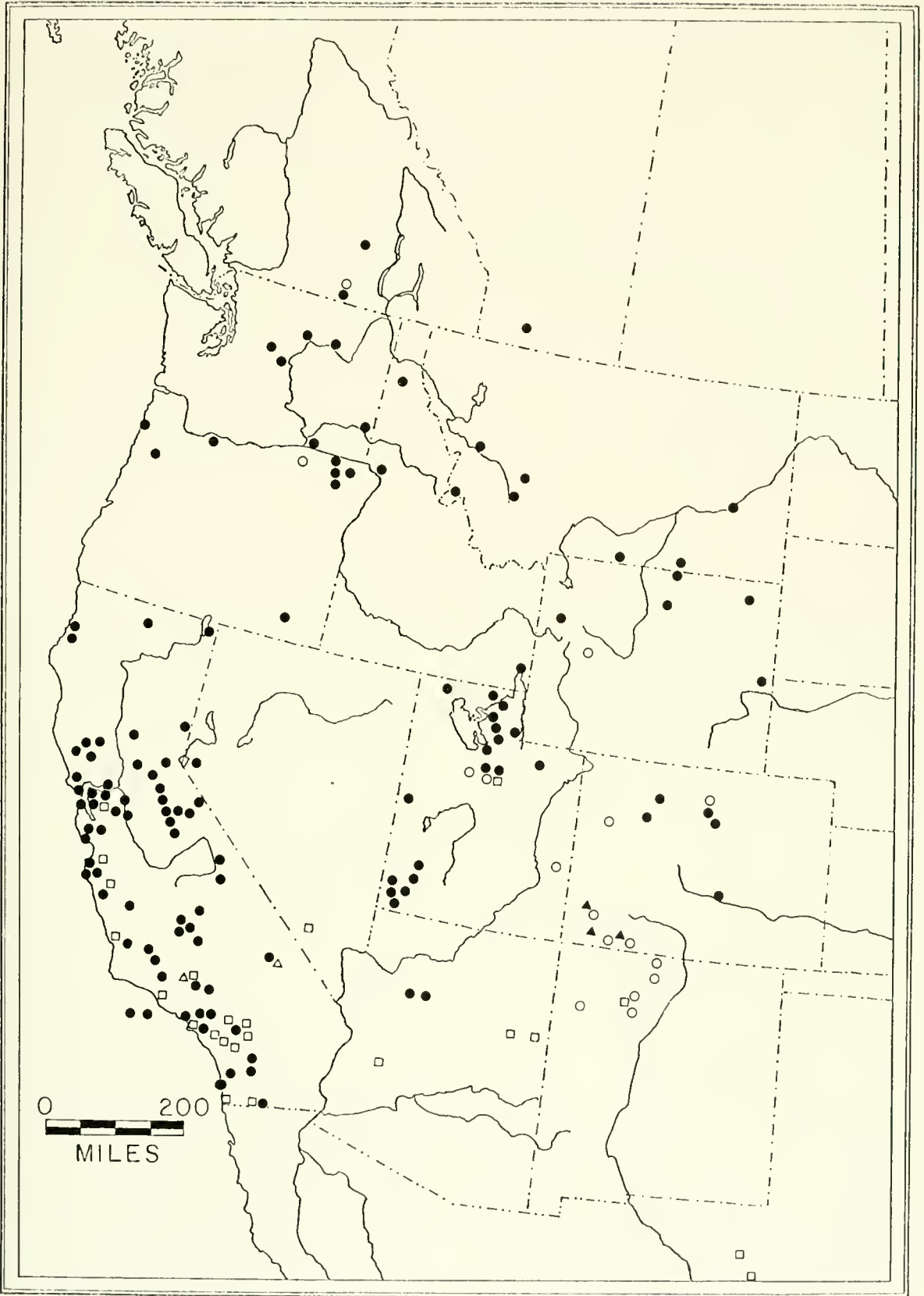


Fig. 21 Map of western United States showing the distributions of *Tychius lamellosus* ○, *T. semisquamosus* △, *T. lineellus* ●, *T. badius* ▲, and *T. prolixus* □

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